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Sport Fishery Abstracts

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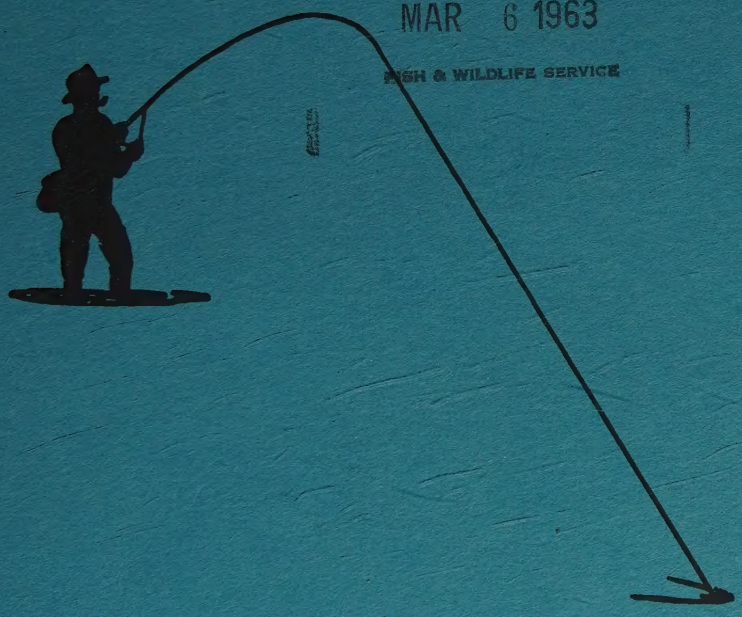

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Sport Fishery Abstracts

An abstracting service for fishery research and management

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of papers on limnology, ecology, natural history and other fields of specialization will be included when the subject has application to the conservation of sport fish and the restoration of sport fishing.

One volume consisting of not more than four numbers will be issued each year. Each number contains separate Author and Subject indexes, with the final number of each volume containing cumulative indexes. The last number of each volume contains a list of publications screened for appropriate material.

Suggestions for improving the usefulness and coverage of Sport Fishery Abstracts are solicited.

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Prepared in the Branch of Federal Aid
S. E. Jorgensen, Chief
Donald F. LaPointe, Editor
Angela S. Sutt, Asst. Editor

5240. Harrison, Richard S., and Keith D. Moore (Oregon Fish Commission, Sandy, Oregon). 1962. SHIPPING SMALL CHINOOK SALMON IN CLOSED PLASTIC CONTAINERS. Prog. Fish-Cult. 24(3): 135-136.

Tests were made with plastic bags, small amounts of precooled water, oxygen, and extended periods of holding. Four cardboard containers, each containing a plastic bag, 1 1/2 gal. of precooled water, 375 unfed chinook salmon Oncorhynchus tshawytscha fingerlings, and oxygen were shipped by plane and car a distance of 388 miles. After about 9 hours in the cartons, the fish were released with no apparent mortality. (Auth.)

5241. Novotny, Anthony J., and Gordon F. Esterberg (U. S. Bur. Comm. Fish., Seattle, Washington). 1962. A 132-KILOCYCLE SONIC FISH TAG. Prog. Fish-Cult. 24(3): 139-141.

The sonic fish tag used in 1957-58 to track adult salmon has been improved by incorporating the latest miniaturized components to form a tag that is smaller in diameter and shorter, that can withstand greater pressures, and has a range at least twice that of the old tag and an operating life three times longer.

5242. Hanks, Robert W. (U. S. Bur. Comm. Fish., Boothbay Harbor, Maine). 1962. A MOUNTING DEVICE FOR RECORDING INSTRUMENTS. Prog. Fish-Cult. 24(3): 137-138.

A stand that is economical, portable, and sturdy has been developed to support delicate and often expensive precision instruments in areas subject to extreme climatic conditions.

5243. Ergens, Radim (Czechoslovak Academy of Sciences, Prague, Czechoslovakia). 1962. DIRECT CONTROL MEASURES FOR SOME ECTOPARASITES IN FISH. Prog. Fish-Cult. 24(3): 133-134.

A new antiparasitic bath to control ectoparasitic protozoa and monogenetic trematodes of fish has been developed. Its advantage is its short action time. The bath has been tried on 30 young carp under laboratory conditions with 100% effectiveness. (Auth.)

5244. Nolting, Donald H. (Colorado Game and Fish Dept., Denver). 1962. A DEVICE FOR EVALUATING THE NUMBERS AND RATES OF DOWNSTREAM FISH MOVEMENTS. Prog. Fish-Cult. 24(3): 131-132.

To evaluate trout losses in a 300-acre reservoir, downstream migrants were captured in the outlet canal at a point just below the outlet gates. The testing device was a 220-volt electric screen capable of paralyzing or killing fish which entered its field. These fish were then trapped against small-mesh metal screens and could be collected for counting and examination. The device was capable of retaining 84% of the fish which entered the electric field. The main disadvantage of this method is the fact that all trapped fish are killed. (Auth.)

5245. Markus, Henry C. (U. S. Bur. Sport Fish. and Wildl., Boston, Massachusetts. 1962. HATCHERY-REARED ATLANTIC SALMON SMOLTS IN TEN MONTHS. Prog. Fish-Cult. 24(3): 127-130.

Water temperature determines the growth rate of trout and salmon and the rate of egg development. Trout eggs, fry, and fingerlings held in water with a temperature in the 30's during the late fall, winter, and early spring require 2 years plus to attain a length of 10 to 14 inches. This same size may be obtained in a shorter time by heating the water to 50° to 55°. Atlantic salmon Salmo salar smolt were produced at the Craig Brook, Maine, National Fish Hatchery in 10 months by raising the water temperature from 38° to 50° F. (Auth.)

5246. Kincheloe, John W. (U. S. Bur. Sport Fish. and Wildl., Cook, Washington). 1962. CULTIVATION AND DRUG SENSITIVITY OF MYXOBACTERIA ISOLATED FROM DISEASED FISH. Prog. Fish-Cult. 24(3): 119-126.

A solid medium was developed on which myxobacteria isolated from fish produced fast and uniform growth permitting evaluation of drugs in vitro. The sensitivity of 23 cultures of myxobacteria to 41 different drugs is reported. (Auth.)

5247. Snow, J. R. (U. S. Bur. Sport Fish. and Wildl., Marion, Alabama). 1962. A COMPARISON OF REARING METHODS FOR CHANNEL CATFISH FINGERLINGS. Prog. Fish-Cult. 24(3): 112-118.

Five methods of rearing channel catfish Ictalurus punctatus fry to a minimum total length of 3 inches were compared. The methods included were: trough-started fry stocked in a spiral raceway; trough-started fry stocked in earthen ponds; newly hatched fry stocked directly into earthen ponds where they were protected for 7 days and fed; newly hatched fry stocked directly in earthen ponds where they were fed from the start, but not protected; and newly hatched fry stocked directly in earthen ponds with no protection, and without artificial food for the first 3 weeks. Survival varied directly with the amount of care supplied to the fry. The maximum production per acre in the ponds was 91,500 fish weighing 1,810 lb., obtained by the trough-started, pond-reared method. The lowest yield was 27,800 fish per acre weighing 920 lb., obtained by the unprotected-unfed pond method. Food conversions, exclusive of natural food in the ponds, ranged from 0.71 to 1.17 lb. of food per lb. of gain. In the raceway experiment the conversion was 1.57. (Auth.)

5248. Regier, Henry A. (New York Dept. of Cons., Ithaca). 1962. ON THE EVOLUTION OF BASS-BLUEGILL STOCKING POLICIES AND MANAGEMENT RECOMMENDATIONS. Prog. Fish-Cult. 24(3): 99-111.

Considerable controversy has centered around the problem of proper stocking and management of American farm ponds for fishing. This paper is an attempt to determine what facts, arguments, and

forces were responsible for making largemouth bass and bluegills the most widely stocked combination in the United States during the 1950's. (Auth.)

5249. Waldichuk, Michael (Fish. Res. Bd. of Canada, Biological Station, Nanaimo, B. C.). 1962. POLLUTION IN COASTAL WATERS OF BRITISH COLUMBIA. Progress Reports of the Pacific Coast Stations, No. 114, pp. 13-18.

Pollution has not yet made serious inroads into our natural marine resources. A careful watch is being maintained through surveys in those areas where pollution might be a threat from existing waste discharges. Most of our problems of marine pollution along the British Columbia coast are connected with pulp mill wastes. As far as fisheries are concerned, the harmful effect stems mainly from the decrease of dissolved oxygen concentrations in the water. Routine tests for dissolved oxygen during oceanographic surveys have enabled us to recognize this effect of pollution when and where it occurs.

Our main approach in pollution investigations, however, is one of prevention rather than correction. Locations of sites for new industries or expansion of existing ones are investigated from the point of view of adequacy for dilution and dispersion of the wastes in adjacent waters and possible effects on the fisheries. Conclusions are drawn from the results of survey data and recommendations are made to the Area Director of the Department of Fisheries for discussion with industry. In this way, a rational and objective approach is taken toward pollution prevention which, in the long run, is far less costly to the industry than later implementation of corrective measures. Proper waste disposal facilities must be as clearly part of the overall plan for a new plant as site selection to suit availability of raw materials, transportation, and market. (Auth.)

5250. Sheridan, William L. (Fisheries Research Inst., Univ. of Washington, Seattle). 1962. VARIABILITY IN PINK SALMON ESCAPEMENTS ESTIMATED FROM SURVEYS ON FOOT. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 408, 7 pp.

Spawning pink salmon were enumerated in five study streams in the Hollis area of Southeastern Alaska. One stream was logged, two were being logged, and two were unlogged. Because enumeration required the ground survey as well as other methods, tests were made to assess variability in estimates of pink salmon abundance from surveys on foot between different observers and between successive counts by the same observer. Variability was lower when observers counted spawning salmon in well-defined riffle areas than when they counted in both pools and riffles. A method is proposed for obtaining more reliable indices of abundance from routine foot surveys. (Auth.)

5251. Daly, Russell, Vernon A. Hacker, and Lawrence Wiegert (Wisconsin Cons. Dept., East Central Area, Oshkosh). 1962. THE LAKE TROUT-ITS LIFE HISTORY, ECOLOGY AND MANAGEMENT. Wisconsin Conservation Department, Publication No. 233, 15 pp.

Includes classification, distribution, description, habits, habitat, reproduction, age and growth, mortality, ecology, economics and management.

5252. Backus, Richard H. (Woods Hole Oceanographic Institution, Woods Hole, Massachusetts). 1962. AGE IN A SMALL SAMPLE OF BLUEFISH POMATOMUS SALTATRIX (LINNAEUS). Breviora, No. 159, 4 pp.

Specimens of age I+ range from 13.9 to 16.5 inches in fork length and have a mean length of 14.85 inches. Specimens of age II+ range from 15.0 to 20.1 inches and have a mean length of 17.48 inches. The sole III+ specimen measures 24.0 inches in fork length. Because of the small size of our sample, these data can do little more than show that snappers (as small bluefish are called) of four to nine inches, seen in the autumn (Bigelow and Schroeder, 1953), are indeed young of the year and that such fish approximately double their length in the succeeding 12 months. (Auth.)

5253. Jones, J. W. (Zoology Dept., University of Liverpool, England), and H. Evans. 1962. SALMON REARING IN MOUNTAIN TARNS--A PRELIMINARY REPORT. Proceedings of the Zoological Society of London, Vol. 138, Part 4, pp. 499-515.

An account is given of a long-term experiment in which salmon were planted as unfed fry in two mountain tarns. Details are given of the scales of these fish and tagging experiments have provided much useful data about the growth of the fish. (Authors)

5254. Whitehead, P. J. P. (Ministry of Forest Development, Game & Fisheries, Kenya). 1962. THE RELATIONSHIP BETWEEN TILAPIA NIGRA (GUNTHER) AND T. MOSSAMBICA PETERS IN THE EASTERN RIVERS OF KENYA. Proceedings of the Zoological Society of London, Vol. 138, Part 4, pp. 605-637.

In the Athi river, Kenya, an upper river population of cichlid fishes has been described as Tilapia nigra, closely resembling T. mossambica in the lower Athi, but distinguished by a higher anal spine count (four to six as against three, rarely four, spines). Field studies indicated a steady increase in anal spine numbers with altitude, and a slight overlap is found in morphometric and meristic characters between the two species. T. nigra is however geographically isolated from T. mossambica in the Athi river by the Lugards Falls, and the consequent reproductive isolation, coupled with meristic and color differences is here considered indicative, if not of complete, at least of incipient speciation. (Auth.)

5255. Carr, Ira A. (Bur. of Comm. Fish., Ann Arbor, Michigan). 1962. DISTRIBUTION AND SEASONAL MOVEMENTS OF SAGINAW BAY FISHES. U. S. Fish and Wildlife Service, Special Scientific

Report--Fisheries No. 417, 13 pp.

The fish collected by the Bureau of Commercial Fisheries' M/V Cisco from Saginaw Bay in 1956 yielded no new species records but provided many new locality records within the Bay. The collection included representatives of 47 species; 74 species are known to occur in the Bay.

Records from trawling in June-October provided information on seasonal distribution and movements of alewives, smelt, and yellow perch. Young (O group) alewives were first taken in shallow water (2-7 1/2 fathoms) in September and were extremely plentiful in October; small catches were made in deep water (8-25 fathoms) in October. Older alewives were most plentiful in the shallow water of the inner part of the Bay in August. Few were taken at any depth in other months.

Young-of-the-year smelt were first taken in July and were subsequently plentiful in shallow water; good catches were made in deep water in October. Older smelt were abundant in shallow areas in June and October but scarce in other months; good deep-water catches were taken in August.

The only substantial catch of O-group yellow perch was made in the shallow water of the inner part of the Bay in October. Larger perch were caught in highly variable, but usually substantial numbers in shallow water in all months of fishing; moderate numbers were caught in deep water in August, and the largest catches at any time or depth were in deep water in October. (Auth.)

5256. Hartt, Allan C. (Fisheries Research Institute, Univ. of Washington, Seattle). 1962. MOVEMENT OF SALMON IN THE NORTH PACIFIC OCEAN AND BERING SEA AS DETERMINED BY TAGGING, 1956-58. International North Pacific Fisheries Comm., Bulletin No. 6, 157 pp.

Salmon were tagged on the high seas in the North Pacific Ocean and Bering Sea in the summers of 1956, 1957, and 1958. Experiments extended from early May through mid-September. Most operations were within 100 miles north and south of the Aleutian Islands from longitude 160° W. to longitude 170° E. Some tagging was done in the north-central Bering Sea, and the Gulf of Alaska.

A total of 36,383 salmon were tagged in the 3 years, the majority being red, chum, and pink salmon.

Studies of the direction of movement of salmon according to the direction of "set" of the purse seines showed clear-cut movement patterns in the vicinity of the Aleutian Islands, which in turn supplemented the migrations shown by tag returns.

A strong westward movement along the south side of the Aleutians was shown for all species with some variations according to location, date, maturity, or species. Various Aleutian passes were shown as important avenues for maturing salmon destined for Bering Sea tributaries.

Most mature red, chum, and pink salmon passed through Aleutian waters between May and late June. At the time of decline in abundance of maturing salmon, immature reds and chums began to appear in the catches and continued available as long as vessels operated (late August).

Tagging in the central Aleutian area produced returns of salmon from such widespread areas as Japan, Russia, many areas on the high seas, northwestern and southeastern Alaska, Canada, and the States of Washington and Idaho.

A total of 9,282 red salmon were tagged. Annual returns of mature salmon varied from 5.3 to 17.1 percent. Immature fish returned 1 and 2 years after tagging yielded up to 3.1 percent returns. Red salmon originating in Bristol Bay predominated throughout Aleutian waters as far west as 173° E. Red salmon of Asian origin apparently were present only in relatively minor numbers as far east as 180°.

A total of 19,383 chum salmon were tagged. Mature fish yielded annual returns between 3.5 and 7.0 percent; immature fish up to 2.8 percent over a 2-year period. Both mature and immature fish in Aleutian waters were of mixed Asian and American origin. Chum salmon, from widespread Asian sources, predominated to 170° W. and were present to at least 163° W.; American fish, primarily of northwestern Alaska stocks, were predominant to 170° W. and present at least to 177° W.

A total of 7,211 pink salmon were tagged, all but 219 of which were mature. Annual returns varied from 0.4 to 2.7 percent. Pink salmon, notably scarce in the Aleutian area in 1956 and 1958, were very abundant in 1957. Tagging in 1957 showed pink salmon in the Aleutian area to be overwhelmingly East Kamchatkan; in 1958, they were predominantly Alaskan as far west as longitude 177° E.

The few silver and king salmon and steelhead trout tagged demonstrated some notably long migrations of these species--the maximum distance traveled was 2,400 miles.

Problems of fishing gear, fish-handling techniques, and types of tags are discussed. (Auth.)

5257. Bakastov, S. S. 1960. SOME DATA ON BOTTOM TEMPERATURES IN THE RYBINSK RESERVOIR WHEN THE SURFACE IS FROZEN. (NEKOTORYE DANNYE PO DONNYM TEMPERATURAM RYBINSKOGO VODOKHRANILISHCHA V PODLEDNYI PERIOD.) Byull. Inst. Biol. Vodokhranilishch Akad. Nauk SSSR. 8/9. 62-66; Referat. Zhur., Biol., 1961, No. 20D607; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21431. 1962.

Curves of the change in bottom temperatures along longitudinal profiles from the channels of the Volga, Mologa, and Sheksna rivers and further downstream to the hydroelectric station show that the bottom temperatures are not a function of depth. Low bottom temperatures are observed in the Volga reach, the upper parts of the Mologa and Sheksna reaches, and in the southeastern part of the reservoir. The temperatures reach less than 1° C and may be explained by the current in this part of the reservoir. The flow of current causes mixing of the colder surface layers, an evening off of the temperatures along the vertical to values close to zero, and a decrease in the temperature of the water at the bottom. Such temperature conditions, which are

much like those found in rivers, are true of the entire Volga reach, the upper part of the Mologa reach to the Pervomaiskii islands, the Sheksna reach as far as the Yagorba locks, and the Sbor reach and the southeastern part of the reservoir which adjoins it. The lowest bottom temperatures were found along the path of the Volga river water from Uglinchskaya to the Rybinsk hydroelectric plant.

5258. Gavrilov, G. B. 1961. THE FORMATION OF THE BOTTOM FAUNA OF ARTIFICIAL RESERVOIRS AND SOME PROBLEMS IN EVOLUTIONARY THEORY CONNECTED WITH THESE PROCESSES. (O FORMIROVANII DONNOI FAUNY ISKUSSTVENNYKH VODOKHRANILISHCH I O NEKOTORYKH VOPROSAKH EVOLYUTSIONNOI TEORII, SVYAZANNYKH S ETIM PROTSESSOM.) Zhur. Obshchei Biol. 22(3): 233-240; Referat. Zhur., Biol., 1961, No. 22D686; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21439. 1962.

In many artificial reservoirs, progressive impoverishment of the bottom fauna is observed, together with the predominance of a small number of groups. Usually, tendipedid larvae dominate, sometimes oligochaetes, and in some cases mollusks. Faunal selection takes place in reservoirs in the form of "uncontrollable bioanthropic" selection, when, at the will of man, conditions are created which permit the development of selection, although man is not yet in a position to guide the process in the necessary direction and the results are not always beneficial to him. As a consequence of selection, processes of ecologic divergence must go on in reservoirs, with ultimate physiologic reorganization of the organism and the appearance of morphologic changes. Interspecies groupings of fish were noted in the Manych Reservoir, changes in the ecology of mysids in the reservoirs of the Krym foothills, and deviant forms of oligochaetes in the Tbilisi Reservoir. (Auth.)

5259. Gromov, V. V. 1961. THE AQUATIC FAUNA OF SUBMERGED WOOD IN SYLVENSK BAY OF THE KAMSK RESERVOIR. (GIDROFAUNA ZATOPLENNOI DREVESINY SYLVENSKOGO ZALIVA KAMSKOGO VODOKHRANILISHCHA.) Zool. Zhur. 40(3): 309-317; Referat. Zhur., Biol., 1961, No. 20D611; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21443. 1962.

The 1735-km^2 Kamsk (Perm) reservoir was completely submerged in 1956. Forests and undergrowth occupied 95% of the flooded area. Between 1955 and 1959, 36 quantitative samples of the hydrofauna were taken in Sylvensk bay; they were living on the surface of trees, bushes, and logs. Fifteen groups of hydrobionts were detected in the samples, among which 26 forms of tendipedid larvae were predominant. At different seasons of the year 23 experiments were carried out with blocks of wood to obtain quantitative data. The blocks were sunk in the water at different depths for 5-20 days. The average maximum summer biomass and amount of tendipedid larvae were noted on the 10th-20th day of the experiment and reached about 2 g/m^2. (Auth.)

5260. Illies, Joachim. 1961. ATTEMPT TO DEVELOP A GENERAL BIOCOENOTIC CLASSIFICATION OF FLOWING WATERS. (VERSUCH EINER ALLGEMEINEN BIOZONOTISCHEN GLIEDERUNG DER FLIESSGEWASSER.) Internatl. Rev. gesamten Hydrobiol. 46(2): 205-213; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21447. 1962.

Everywhere in the world most streams begin with low but rather uniform temperatures and high velocity in the highlands, then pass to low altitudes. The author has been struck by the similar biocoenoses in corresponding portions of streams in various regions. He proposes to classify stream region into the rhithron and the potamon. The former is the region from the source to where the water fluctuates 20° C in temperature and has rapid currents, while the latter is the region where the temperature fluctuates more than 20°, or is always higher than 20° (in the tropics), and where currents are slower. Each of these two regions is then subdivided into epi-, meso- and hypo-regions, thus epirhithron, mesorhithron, etc. As examples, four rivers that have been studied previously, or observed by the author, are described: the Fulda-Werra in Germany, the Huallaga-Maranon-Amazon in Peru and Brazil, the Chillon in Peru and the Great-Berg in South Africa. (C. C. D.)

5261. Malmer, Nils (Bot. Mus., Lund, Sweden). 1961. ECOLOGIC STUDIES ON WATER CHEMISTRY OF LAKES IN SOUTH SWEDEN. Bot. Notiser 114 (2): 121-144; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21453. 1962.

Analyses of waters are given from 33 lakes in three sampling areas within the South Swedish oligotrophic region. Short descriptions of the vegetation in the lakes are also given. The results of the analyses indicate the great importance of the airborne salts for the concentrations of the major constituents in lake waters poor in electrolytes. Due to this atmospheric transport differences are found in the concentrations of Na and Cl in South Sweden and in SO_4 also between South and North Sweden. The ecologic significance of the figures presented is discussed. (Auth.)

5262. Moraczewski, J. 1961. THE INFLUENCE OF THE LOW WATER LEVEL ON THE POLLUTION DEGREE OF THE RIVER VISTULA IN WARSAW. (WPYW NISKIEGO STANU WODY NA STOPIEN ZANIECZYSZCZENIA WISLY W WARSZAWIE.) Polsk. Arch. Hydrobiol. 9: 159-173; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21458. 1962.

The influence of extremely low water level on the degree of water pollution in Vistula near Warsaw in 1959 was examined. Comparison of the analysis performed leads to the following conclusions: Microbiological and chemical investigations did not reveal clearly the influence of the low water level on the degree of water pollution in 1959. Only BOD_5 and increased total residue seem to indicate the dependence between the water level and the degree of water

pollution. Seston investigations have proven that during low water level the degree of water pollution increases and is followed by a considerable increase of the organisms number. In the period of investigations (1956-1959) the degree of pollution of Vistula river was increased. In spite of the strong contamination caused by city sewage the water of Vistula river undergoes a considerable self-purification on the distance of 26 km between Mlociny and Kazum. (Auth.)

5263. Patalas, Kazimierz. 1960. THERMAL AND OXYGEN CONDITIONS AND TRANSPARENCY OF WATER IN 44 LAKES OF WEGORZEWO DISTRICT. (STOSUNKI TERMICZNE I TLENOWE ORAZ PRZEZROCZYSTOSC WODY W 44 JEZIORACH OKOLIC WEGORZEWA.) Rocz. Nauk Rolniczych Ser. B Zootech. 77(1): 105-222; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21462. 1962.

Limnological research of lakes in Wegorzewo district is part of the combined project of fishery management of those lakes. This work deals with thermal and oxygen conditions as well as transparency of water, from the point of view of primary production and its influence on differentiation of the basin into zones of various availability for water organisms. During the period from 1953 to 1955 the lakes near Wegorzewo in the northern part of Mazurian Lake district were surveyed. In 6 of them, during one year, monthly temperature measurements were taken, and in the same time oxygen contents and transparency of water observations were conducted. In the rest of the lakes analyses were carried out only in the months of March, May, and August. According to Nauman's and Thienemann's classification, the majority of the lakes should be considered as, largely speaking, eutrophical types of lakes despite the fact that a great variety of temperature and oxygen conditions was observed in them through the year. A general inquiry into the thermal changes of the chosen lakes was conducted, namely the lakes Zabinki, Goldopiwo, Swiecajty, Krzywa Kuta, Bimbinek and Biala Kuta differing by the area, shape and depth. (Auth.)

5264. Petkevich, A. N. 1959. THE FORMATION OF THE BIOLOGICAL REGIME OF THE NOVOSIBIRSK RESERVOIR. (O FORMIROVANII BIOLOGICHESKOGO REZHIMA NOVOSIBIRSKOGO VODOKHRANILISHCHA.) Dok. Soveshchaniia po Obshch. Vopr. Biol. Posviashch. Stoletiiu Darvinizma 1959. 276-279; Referat. Zhur., Biol., 1961, No. 9D495; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21465. 1962.

Biological investigation of the Novosibirsk Reservoir was conducted during the first two years of its existence in 1957 and 1958. In the first year a reduction in the qualitative composition of zooplankton took place. The biomass of zooplankton fluctuated within the limits of 8.5 to 2697 mg/m^2. The biomass was greater than those of the river, channels and tributaries, but less than those of the river lakes. The density of zooplankton increased as the dam was approached. The bottoms of former reservoirs are populated primarily by water organisms, flooded bottom land by the larvae of tendipedids. The average biomass of the benthos fluctuated from 7 to 22 g/m^2. In the second year the biomass of benthal fauna increased. Inferior and predatory fish predominate in the reservoir, such as roach, perch, and pike. Measures must be taken toward the suppression of undesirable fish and the strengthening of the role of predators. Construction of a hatchery for sturgeon and nelma at the dam of the hydroelectric station is also necessary, along with the establishment of a fish ladder for the passage of fish to the upper level.

5265. Salmanov, M. A. 1960. THE RATIO OF INITIAL PRODUCTION AND DESTRUCTION OF ORGANIC MATTER OF THE MINGECHAUR RESERVOIR. (SOOTNOSHENIE PERVICHNOI PRODUKTSII I DESTRUKSSI ORGANICHESKOGO VESHCHESTVA V MINGECHAURSKOM VODOKHRANILISHCHE.) Biull. Inst. Biol. Vodokhranilishch Akad. Nauk SSSR 7. 6-9; Referat. Zhur., Biol., 1961, No. 9D496; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21466. 1962.

The initial production of organic matter was determined by the isotope method, initial destruction by the method of G. G. Vingerg. Comparison of data showed that destruction exceeded production by a factor of 2.5, and that this is apparently linked to the oxidation of readily assimilated organic material of allochthonous origin. Photosynthesis proceeds in the layer of water from 0 to 12 m; the breakdown of organic matter takes place in all depths of water from 0 to 26 m. The similar occurrence of breakdown exceeding synthesis was noted also in a series of reservoirs.

5266. Tsuda, Matsunae, Ikue Akagi, and Toshiharu Watanabe (Nara Women's Univ., Japan). 1961. ON THE BIOTIC INDEX OF WATER POLLUTION BASED UPON THE SPECIES NUMBER OF MACROSCOPIC ANIMALS. Japanese Jour. Ecol. 10(5): 198-201; Biological Abstracts, Vol. 38, No. 6, Abst. No. 21474. 1962.

A simplified method (biotic index) is proposed by Beck for reporting the biological investigations in connection with stream quality surveys. The biotic index proposed is 2A+B, where A is the number of the intolerant species and B is that of the tolerant species. The following restrictions are suggested: (1) The sampling should be made from an area of 50X50 cm. (2) The sampling should be made from the stony bottom with the velocity of 50 — 10 cm/sec. Two examples are given, one from the Kamogawa River and the other from the Yodogawa River. (Authors)

5267. Marak, Robert R., John B. Colton, Jr., and Donald B. Foster (Bur. of Commercial Fisheries, Woods Hole, Massachusetts). 1962. DISTRIBUTION OF FISH EGGS AND LARVAE, TEMPERATURE, AND SALINITY IN THE GEORGES BANK-GULF OF MAINE AREA, 1955. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 411, 66 pp.

Basic data on the distribution of fish eggs and larvae in the Georges Bank-Gulf of Maine area were collected on surveys made by the Bureau of Commercial Fisheries research vessel Albatross III during the spring of 1955. The data are presented in tabular and graphic form. Plots and tables of surface temperature and salinity are also included. (Authors)

5268. Waters, Thomas F. (Dept. of Entomology and Economic Zool., Univ. of Minnesota, St. Paul). 1962. A METHOD TO ESTIMATE THE PRODUCTION RATE OF A STREAM BOTTOM INVERTEBRATE. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 243-250.

An approach toward the development of a method to estimate the production rate of primary consumers in a stream was as follows: For a given unit area of stream bottom, the production rate (B) is equal to the algebraic sum of the rate of change in population density (P) and the difference between the rates of removal (R) and accrual (A):

$$B = P + (R - A).$$

Since removal and accrual both appear, for certain species, to be principally in the form of downstream drift, minimal production rates could be estimated with data on population density and total drift into and off of the unit areas of study. Population density data were obtained from periodic bottom samples, and drift nets were employed in a sampling procedure to estimate total drift rates at the various stream stations.

Production rates of a mayfly, Baetis vagans McDunnough, were estimated for two 24-hour periods in two riffles and two pools. The mean production rate on the riffles was 0.28 gram per square meter per day. In the pools, B was negative, indicating consumption; consumption rate in the pools was 0.45 gram per square meter per day. (Auth.)

5269. Netsch, Lt. Norval F., and Arthur Witt, Jr. (Dept. of Zool., Univ. of Missouri, Columbia). 1962. CONTRIBUTIONS TO THE LIFE HISTORY OF THE LONGNOSE GAR, LEPISOSTEUS OSSEUS, IN MISSOURI. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 251-262.

The age and growth of the longnose gar in central Missouri were determined from the branchiostegal rays. Males and females differed markedly in growth and longevity. One-year-old males were 19.5 inches long, and females were 22.0 inches long. Females continued to grow approximately one inch a year for 13 to 14 years, and outlived the males. Males matured between 3 and 4 years of age, and females at about 6 years of age. Sex ratios changed with the age of the fish; initially they were in favor of the males, and after 10 years, they were in favor of females. The average number of eggs per female was 27,830; range 4,273 and 59,422. The mature eggs are toxic to mice and other higher vertebrates, but are probably not toxic to fishes.

Twenty young-of-the-year gar were raised experimentally for 52 days, and grew at the rate of 2.95 millimeters per day. Their gross metabolic efficiency during this time was 43.1 percent, and their food conversion factor was 2.34. Young-of-the-year gar ate an average of 9.1 percent of their body weight per day, and digestion was completed at the end of 24 hours. These factors, in part, cause the longnose gar to be one of the fastest growing freshwater fishes, growing up to 6 times faster than other common, large, freshwater fishes. (Authors)

5270. Heard, William R. (Bur. of Comm. Fish., Biological Lab., Auke Bay, Alaska). 1962. THE USE AND SELECTIVITY OF SMALL-MESHED GILL NETS AT BROOKS LAKE, ALASKA. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 263-268.

Fine-thread gill nets with meshes of 3/8-, 1/2-, 3/4-, 7/8-, and 1 inch (stretched measure) were used to sample lake-dwelling juvenile sockeye salmon, Oncorhynchus nerka, and associated small fishes in Brooks Lake, Alaska. Thirteen of 20 species known to occur in the lake were sampled with the small meshes. Sockeye salmon, Alaska blackfish (Dallia pectoralis), threespine stickleback (Gasterosteus aculeatus), ninespine stickleback (Pungitius pungitius), and sculpins (Cottus spp.) less than 50 millimeters in length were sampled. Different selectivity patterns were shown by different species in various mesh sizes. Meshes smaller than 1 inch had low catch efficiencies, although these meshes were useful for qualitative assessment of small fishes. (Auth.)

5271. Johnson, James H. (Bur. of Comm. Fish., Biological Lab., San Diego, California). 1962. SEA TEMPERATURES AND THE AVAILABILITY OF ALBACORE OFF THE COASTS OF OREGON AND WASHINGTON. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 269-274.

Wide variations exist in landings of albacore, Thunnus germo, in Oregon and Washington. In 1944, Oregon and Washington landings reached 34 million pounds, but dropped to 0.6 million pounds a decade later. Variations in landings may be a result of fluctuations in availability. Distribution of albacore along the North American coast is known to be influenced by sea temperatures. Although weather conditions and economic factors are reflected in Oregon-Washington landing statistics, it may be that annual variations in sea surface temperatures are also affecting the success of the fishery by varying availability to the fishermen.

Relationship between sea surface temperatures and landings was investigated for the years 1947-60. In years of above-normal temperatures, landings were, in general, significantly greater than in years of below-normal temperatures. Whereas warm water did not insure a good fishery, widespread cold water was detrimental to success of the fishery. The data suggests that in June, if the sea temperature anomaly is large enough, it is possible to predict whether or not sea temperatures will be favorable for albacore at normal time of commencement of the fishery in mid-July. (Auth.)

5272. Lewis, Robert M. (Bureau of Comm. Fish., Beaufort, North Carolina). 1962. SEXUAL MATURITY AS DETERMINED FROM OVUM DIAMETERS IN STRIPED BASS FROM NORTH CAROLINA. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 279-282.

Sexual maturity of striped bass, Roccus saxatilis (Walbaum), was investigated in the Albemarle Sound-Roanoke River system of North Carolina during the periods October 1956 through January 1957, October 1957 through April 1958, and April through September 1960. A method which permitted the determination of maturity through the measurement of ova was used. Percentages of mature female fish during several months prior to spawning are given by age group. At age-group VII and older, there was evidence of intermittent spawning and the possibility of cessation. (Auth.)

5273. Regier, Henry A. (Dept. of Conservation, Cornell Univ., Ithaca, New York). 1962. ON ESTIMATING MORTALITY COEFFICIENTS IN EXPLOITED FISH POPULATIONS, GIVEN TWO CENSUSES. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 283-294.

Biologists frequently assume that the number of individuals in a "discrete" population follows an exponential relationship with respect to time, at least over the latter part of the life of the members. Such a discrete population may be, for example, a year class of a particular species of fish in a particular body of water.

In an exploited population some individuals die from natural causes, and others are harvested. To estimate the extent of natural mortality a common assumption is that total, natural, and fishing mortality coefficients are all constant over the period of study. The present paper differs in that it assumes that only the natural mortality coefficient is constant throughout the period. It assumes that the fishing mortality coefficient is zero when no harvesting occurs, finite and constant when harvests are made over an extended period, and almost infinitely large when large harvests are made in short periods. (Auth.)

5274. Shetter, David S., and Gaylord R. Alexander (Michigan Department of Conservation, Lewiston). 1962. EFFECTS OF A FLIES-ONLY RESTRICTION ON ANGLING AND ON FALL TROUT POPULATIONS IN HUNT CREEK, MONTMORENCY COUNTY, MICHIGAN. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 295-302.

Effects of a flies-only regulation on angling and on fall populations of wild brook trout were tested on 5,000 feet of Hunt Creek, Montmorency County, Michigan. Complete angling records and population estimates for the period 1949-54, when all sections were fished under normal state regulations, were compared with records for the period 1955-59, when sections Z and A were fished under a flies-only regulation, and B and C continued under normal rules. Yearly totals for angling load, catch, angling quality, pounds of trout creeled, small trout released, and postseason (fall) population estimates were compared. Averages for the 5 years after the lure regulation was changed were compared with averages for the years before the change for both Z and A and the B and C controls. Also, annual totals for Z and A were related to corresponding annual totals for B and C to provide ZA/BC ratios for before-and-after comparisons.

While flies only were used on Z and A (1955-59), angling pressure decreased, catch per hour increased considerably, and total catch increased slightly. During the same time fishing pressure increased considerably in B and C, catch per hour increased slightly, and total catch increased greatly. Statistically significant increased were found in actual and relative fishing pressure and total catch in B and C, and in actual catch per hour in Z and A. Numbers of small fish hooked and released changed little between experimental periods for either water. Fall populations of legal-sized trout in both waters were higher in 1955-59 than in 1949-54; the increase was statistically significant only for the any-lure sections (B and C). Fall populations of sublegal brook trout during the two periods were almost identical in Z and A; they increased slightly in B and C.

The main effect of the flies-only regulation was a greater catch per hour for the fewer anglers who fished Z and A during 1955-59. The flies-only regulation did not increase the sublegal population in Z and A. (Authors)

5275. McIntire, C. David, and Carl E. Bond (Oregon State Univ., Department of Fish and Game Management, Corvallis). 1962. EFFECTS OF ARTIFICIAL FERTILIZATION ON PLANKTON AND BENTHOS ABUNDANCE IN FOUR EXPERIMENTAL PONDS. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 303-312.

Effects of phosphorus and nitrogen fertilizers on the abundance of fish food organisms were investigated in four newly excavated ponds. Before fertilization the ponds were characterized by low nitrogen and phosphorus concentrations, pH values near neutrality, low total alkalinities, and dissolved oxygen concentrations near saturation. After fertilizers were added to three ponds, chemical and physical conditions were altered considerably by the production of large quantities of plankton organisms. Establishment of plankton populations was followed by development of benthic communities, especially in the two ponds receiving both nitrogen and phosphorus. The benthic community developed most rapidly, and the biomass became greatest in the pond receiving the heaviest applications of nitrogen and phosphorus. In ponds which received no phosphorus, benthic production was low. (Authors)

5276. Darnell, Rezneat M. (Dept. of Biology, Marquette Univ., Milwaukee, Wisconsin), and Richard R. Meierotto. 1962. DETERMINATION OF FEEDING CHRONOLOGY IN FISHES. Transactions of the American Fisheries Society, Vol. 91, No. 3, pp. 313-320.

A method is presented for determining the

24-hour chronology of feeding intensity in natural populations of fishes based upon stomach food analyses and digestion rate experiments. The method is illustrated by studies on a population of young black bullheads. Two distinct feeding periods are recognized, the major peak occurring just before dawn, and a minor peak shortly after dark. Little food of any kind is taken during the middle of the day or around midnight. Although several sources of error are currently recognized, the method should eventually prove valuable in the quantitative analysis of aquatic food chains. (Authors)

5277. Shelbourne, J. E. (Fisheries Laboratory, Lowestoft, England). 1962. A PREDATOR-PREY SIZE RELATIONSHIP FOR PLAICE LARVAE FEEDING ON OIKOPLEURA. Journal of the Marine Biological Association of the United Kingdom, Vol. 42, No. 2, pp. 243-252.

Pelagic plaice larvae in the southern North Sea normally feed exclusively on the appendicularian Oikopleura dioica, and the size of prey eaten can be estimated from the Oikopleura faecal pellets found in the larval gut.

Predator-prey size measurements show that smaller plaice larvae are restricted to smaller prey, and that, as larval growth proceeds, so their feeding versatility increases, to include all sizes of Oikopleura at a late pelagic stage of development. Competition for food will therefore be keenest in the early larval stages, when prey-size restriction prevails. This accords with Hjort's hypothesis regarding brook strengths.

As growth proceeds, so plaice larvae begin to discriminate for prey size. At the close of the pelagic phase, the degree of size selection is roughly equal to that of a 60-mesh to I in. plankton net. (Auth.)

5278. Pearcy, William G. (Dept. of Oceanography, Oregon State University, Corvallis), and Sarah W. Richards. 1962. DISTRIBUTION AND ECOLOGY OF FISHES OF THE MYSTIC RIVER ESTUARY, CONNECTICUT. Ecology, Vol. 43, No. 2, pp. 248-259.

A total of 59 species of fishes were collected from the Mystic River estuary from June 1958 to February 1960, including the eggs of 13 species, the larvae of 26 species, and the juveniles and adults of 51 different species.

Pelagic eggs, common in the plankton collections from May to August, were dominated by the eggs of 2 species of Labridae.

A large peak in the seasonal abundance of fish larvae during March-April 1959 and January 1960 was due to species that lay demersal eggs, mainly Pseudopleuronectes americanus and Microgadus tomcod. A secondary peak in larval abundance occurred during the summer and consisted mostly of species that lay pelagic eggs.

Although more kinds of eggs were collected in the lower estuary than in the upper estuary, the variety of the larvae in these 2 regions was about the same. A much greater number of larvae was found in the brackish waters of the upper estuary where P. americanus and M. tomcod larvae were most concentrated.

Ninety-seven percent of the total number of larvae collected hatched from demersal eggs. The larvae of these species were often much more abundant in bottom waters than in surface waters.

The number and variety of juvenile and adult stages was maximal in spring and summer and minimal during early winter. High catches of large adult fishes were made in late winter and early spring when spawning aggregations of P. americanus were present.

A greater number of species had demersal eggs in the estuary than in adjacent neritic areas.

The adaptive significance of demersal eggs in estuaries is discussed; it is postulated that demersal eggs are important in reducing offshore dispersal by currents, and that the vertical distribution of larvae from this egg type may enhance retention within the estuary. (Authors)

5279. Waters, Thomas F. (Dept. of Entomology and Economic Zool., University of Minnesota, St. Paul). 1962. DIURNAL PERIODICITY IN THE DRIFT OF STREAM INVERTEBRATES. Ecology, Vol. 43, No. 2, pp. 316-320.

Diurnally recurring changes in the drift rate (defined as the quantity of organisms drifting downstream per unit time per unit stream width) of several species of invertebrate organisms were observed in a small Minnesota stream. These changes usually were a precipitate increase in drift rate about 1 hour after sunset, a decrease through the night, and a sharp return to daytime low values at about sunrise. In some cases, a 2nd peak in drift rate occurred during the night, possibly being related to the occlusion of moonlight. Active, free-swimming species, the crustacean Gammarus limnaeus Smith and the mayfly Baetis vagans McDunnough, exhibited these changes most strongly. Glossosoma intermedium (Klapalek), a stone-encased caddisfly, exhibited similar changes in drift rate but was present in the drift without its case. Data on the dipteran Dixa, though inconclusive, also suggested a slight increase in drift rate at night. An adult bug, Hesperocorixa, exhibited high drift rates in early night, apparently the result of an evening flight originating elsewhere. Simulium was common in the drift but exhibited no diurnal periodicity. A snail and another stone-encased caddisfly, Limnephilus, though abundant in the stream, appeared only rarely in the drift. For all species, drift rates were much higher in summer than in winter. (Auth.)

5280. Marples, Timothy G. (Dept. of Zoology, University of Otago, New Zealand). 1962. AN INTERVAL PLANKTON SAMPLER FOR USE IN PONDS. Ecology, Vol. 43, No. 2, pp. 323-324.

A description is given of a simple, inexpensive interval sampler used for estimating the horizontal distribution of plankton in small bodies of water. Included also are results obtained from a series of hauls across a small pond. (Auth.)

5281. Posewitz, James A. (Montana State College, Bozeman). 1962. OBSERVATIONS ON THE FISH POPULATION OF WILLOW CREEK RESERVOIR, MONTANA. Proceedings of the Montana Academy of Sciences, Vol. 21, pp. 49-69.

Observations were made on the spawning, growth, distribution, movement, and harvest of trout in Willow Creek Reservoir from March 27 through November 5, 1960.

The only successful reproduction was observed in Willow Creek.

Of rainbow trout observed in spawning runs, 32 percent were identified as fish planted in 1959 or 1960.

Growth rate of rainbow trout was less in 1960 than in previous years (1949, 1954, and 1955).

Distribution of trout in the reservoir appeared to be correlated with water temperatures. Rainbow trout were most evenly distributed in the reservoir when water temperatures were warmest, but were concentrated near the surface when water temperatures were cool.

Brown trout were most restricted at maximum water temperatures, and were most abundant near the bottom in all gill net series.

The game fish caught by gill nets included 69.05 percent rainbow trout, 30.04 percent brown trout, 0.68 percent brook trout, and 0.23 percent mountain whitefish.

A total of 80.1 percent of rainbow trout taken in gill nets was believed to be fish planted in 1959 and 1960.

Anglers took an estimated 14,868 fish from Willow Creek Reservoir during the six-weeks fishing season in 1960, with an averate of 4.03 fish per fisherman at a rate of 0.775 fish per hour.

The anglers' catch was composed of 97.27 percent rainbow trout, 2.47 percent brown trout and 0.26 percent brook trout.

Of rainbow trout taken by anglers, 71.4 percent were identified as fish planted in 1959 and 1960.

Thirty-one of 710 fish marked in the tributaries were recovered and found to be widely distributed in the reservoir and tributaries.

Marked hatchery fish planted in Willow Arm were also widely distributed, being recovered in both arms of the reservoir and in Willow Creek. (Auth.)

5282. Liepolt, R. 1960. A DEEP-WATER SAMPLER FOR THE STUDY OF MICRO-STRATIFICATION NEAR THE BOTTOM OF STAGNANT WATERS. Wass. u. Abwass., 20-27; Water Pollution Abstracts, Vol. 35, No. 3, Abst. No. 462. 1962.

The author describes, with diagrams, a sampler designed to draw samples of water simultaneously from several depths within 1 m of the bottom. The water for each sample passes in series through four flasks so that the first, after several rinsings, is unaffected by the air originally in the flask and is used for gas determinations. The importance of the micro-layer next to the bottom sediment and the use of the apparatus in several lakes are described.

5283. Chase, E. S. 1961. POLLUTION OF THE ANDROSCOGGIN RIVER. Proc. Amer. Soc. Civ. Engrs. 87, SA2, 9-19; Water Pollution Abstracts, Vol. 35, No. 3, Abst. No. 552. 1962.

The author reviews conditions in the Androscoggin river from 1940 to the present day. The river, which rises at the junction of Maine, New Hampshire, and the province of Quebec, is about 200 miles long and enters tidewater at Brunswick, Me.; it is polluted with domestic sewage and, particularly, with the waste waters from 3 large pulp and paper mills. Legal action by the Attorney General in 1943 resulted in a court order requiring remedial measures. As a result storage lagoons were installed for controlled discharge of spent sulphite liquor, the production of sulphite pulp was limited, changes in manufacturing processes were introduced, and sodium nitrate was added to the pool above the power dam at Lewiston to control sulphide odors. An administrator was appointed by the court to ensure that the regulations were complied with, and regular analyses of the river were carried out. There has been a gradual improvement in the condition of the river, and odors have been almost completely eliminated; further improvement is expected when the pulp mill at Rumford is converted to the sulphate process in 1961. The addition of sodium nitrate to the river in the critical Lewiston-Auburn area was found to be effective in inhibiting production of hydrogen sulphide.

5284. Anonymous. 1961. BUBBLE GUN FOR DESTRATIFICATION. Wat. & Wat. Engng, 65, 70-71; Water Pollution Abstracts, Vol. 35, No. 3, Abst. No. 555. 1962.

An illustrated description is given of the "Bubble-Gun", a low-lift pump, operated by means of compressed air, and used to reduce the height of waves in the sea or to alleviate the effects of stratification in reservoirs, lakes and watercourses. Examples are included of the beneficial effects of such destratification, including prevention of ice formation, dispersal of toxic hypolimnetic water, minimization of the effects of autumn "overturn", discharge of hypolimnetic water as compensation water, and aeration of organic effluents. Further experiments are planned on the use of this equipment to increase the supply of nutrients in the epilimnion of a stratified lake during the summer season, thus boosting the total plankton production and improving freshwater fisheries, particularly in the tropics where fish life is frequently restricted to the top few feet of a heavily stratified lake.

5285. Saunders, J. W., and M. W. Smith (Fish. Res. Bd. of Canada, Biol. Sta., St. Andrews, N. B.). 1962. TRANSPLANTATION OF BROOK TROUT (SALVELINUS FONTINALIS (MITCHILL)) WITHIN A SMALL STREAM SYSTEM. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 388-394.

Native brook trout were transplanted within the Ellerslie Brook System, Prince Edward Island, in summer, to determine how well they could compete

with trout already resident in other habitats of the same stream. The resident trout in a habitat appeared to have a competitive advantage. This advantage was greater in habitats of low trout-carrying capacity. Transplanted trout fared better in partially depopulated habitats. Mortalities were higher among the transplanted trout during the ensuing 12-month period. Few transplanted trout homed to the area from which they had been displaced. (Authors)

5286. Saheki, S., R. Yasumoto, and K. Mori. 1958. STUDIES ON NUCLEAR SPECIES IN CONTAMINATED FISH AND THEIR MOVEMENT IN THE BODY OF THE FISH. Proc. 2nd Japan Conf. Radio-isotopes, Tokyo, 1560-1597; Nuclear Sci. Abstr., 1961, 15, 3328; Water Pollution Abstracts, Vol. 35, No. 3, Abst. No. 570. 1962.

The uptake of various radioactive isotopes by fish was investigated. Zinc-65, manganese-54, barium-140, lanthanum-140, strontium-90, yttrium-90, strontium-89, and iron-55 were absorbed rapidly from the water. When the fish were subsequently transferred to uncontaminated water, about 1/2 to 1/4 of their absorbed radioactivity was lost in 2-7 days; after this period decrease in activity was slow. Cerium-144, praseodymium-144, ruthenium-106 and rhodium-106 were also absorbed easily by fish; when contaminated fish were transferred to fresh water most of the radioactivity was lost in 3-9 days.

5287. Gould, W. R., and T. C. Dorris. 1961. TOXICITY CHANGES OF STORED OIL REFINERY EFFLUENTS. J. Wat. Pollut. Contr. Fed., 34, 1107-1111; Water Pollution Abstracts, Vol. 35, No. 3, Abst. No. 582. 1962.

Experiments were carried out to determine the effect of storage at room temperature on the toxicity of oil refineries' waste waters, using effluents of different degrees of toxicity. The test fish were fathead minnows (Pimephales promelas). Two of the effluents, with initial TL_m values of 7 and 18 respectively, showed no significant change in toxicity during storage for 30 days. The toxicity of a third effluent, with an initial TL_m value of 65, decreased during the 4th and 8th days of the 32-day storage period. The fourth effluent, which was obtained from a holding pond, did not kill a sufficient number of the test animals to be treated statistically, but there was evidence that its toxicity decreased during storage. It is thought that the low toxicity of the effluents taken at points along a series of holding ponds is the result of biological action on effluents of initially high toxicity, and the microorganisms remaining in the samples continued to reduce the toxicity during the period of storage.

5288. Štěpánek, M. 1960. CONTRIBUTION TO RESERVOIR TYPOLOGY. Sci. Pap. Inst. chem. Technol., Prague, Fac. Technol. Fuel Wat., 4, Pt. 2, 345-374; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 644. 1962.

In discussing the problems and importance of reservoir classification, the author emphasized the need for distinguishing between the static nature of lakes and the dynamic aspects which must be considered in relation to reservoirs. The factors which affect the biocoenose of a reservoir and which should be considered in the classification of reservoirs are shown in a diagram and discussed; and a procedure is proposed for determining the type of a reservoir.

5289. Marvan, P. 1960. NOTES ON THE APPLICATION OF MEMBRANE FILTRATION FOR QUANTITATIVE PHYTOPLANKTON RESEARCH. Sci. Pap. Inst. chem. Technol., Prague, Fac. Technol. Fuel Wat., 4, Pt. 1, 399-418; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 646. 1962.

The precautions necessary in using the membrane filter method for quantitative studies of phytoplankton are explained and experimental studies, with tabulated results, are reported in which the membrane filter method was compared with a centrifuge method. The membrane filter method gave the best results; with species having small cells (less than about 2μ) certain losses occurred but they did not exceed those observed using the centrifuge method. Modifications of the membrane filter method more suitable for use with different sizes and concentrations of phytoplankton were also considered.

5290. Marvan, P. 1957. METHOD FOR THE QUANTITATIVE DETERMINATION OF NANNOPLANKTON USING MEMBRANE FILTERS. Preslia, 29, 76-83; Sci. Pap. Inst. chem. Technol., Prague, Fac. Technol. Fuel Wat., 1960, 4, Pt. 2, 477; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 647. 1962.

The membrane filter technique has been modified for use in the determination of phytoplankton, using collodion membrane filters prepared in the laboratory. In tests with Scenedesmus and Ankistrodesmus species, the method was found to give an average relative error of only 1.51 percent.

5291. Zelinka, M. 1960. THE DEVELOPMENT OF BIOLOGICAL CONDITIONS IN A RESERVOIR NEAR VIR DURING THE FIRST YEARS AFTER FILLING. Sci. Pap. Inst. chem. Technol., Prague, Fac. Technol. Fuel Wat., 4, Pt. 1, 429-476; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 650. 1962.

A report, including tabulated and graphical data, is given of an extensive investigation of the quality of water in a reservoir near Vir on the river Svratka in the Morava river basin, Czechoslovakia, during the first 5 years after filling began, 1954-1958. The chemical and biological characteristics of the incoming Svratka river water are shown in tables; rivers in the Vir basin are only slightly affected by the discharge of waste waters, information on which is also tabulated. The principal changes in the quality of reservoir water occurred after only a few months, further changes appearing only in the biological conditions. Marked zoning of temperature in the reservoir was observed; the color of the water has been affected permanently by humic substances; and the

transparency of the water decreases greatly in summer as a result of plankton development. Complete oxygen depletion is never observed but there are considerable decreases in oxygen concentration in the metalimnion at the end of summer. The water is very soft, moderately acid (with a decrease in pH value to 5.5 in the deeper waters), and aggressive. The bacteriological quality of the water is good, the coliform count being, in general, less than 1000 per litre. The quantity of phytoplankton tended to increase until 1957 and then decreased markedly; the predominant feature is the summer development of blue-green algae. The quantity of zooplankton also tended to increase and a characteristic community developed after 2 years; Chydorus sphaericus was abundant in the pelagial during the period of development of blue-green algae. The bottom deposits and the presence of benthos were very irregular. It is concluded that the most suitable water to be taken for water supplies is that in the middle layers of the hypolimnion, since it possesses the best and most stable composition. To develop the fisheries, it will first be necessary to reduce the large numbers of small fish which have multiplied.

5292. Štěpánek, M. 1960. LIMNOLOGICAL STUDY OF THE RESERVOIR SEDLICE NEAR ŽELIV. X. HYDROBIOCLIMATOLOGICAL PART. THE RELATION OF THE SUN RADIATION TO THE PRIMARY PRODUCTION OF NANNOPLANKTON. Sci. Pap. Inst. chem. Technol., Prague, Fac. Technol. Fuel Wat., 4, Pt. 2, 21-141; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 653. 1962.

In the period July 1954-December 1958, investigations were made of the phytonannoplankton, light transmission, and transparency of water in the Sedlice reservoir, Czechoslovakia. Results for the earlier years were published previously (see Wat. Pollut. Abstr., 1961, 34, Abstrs. Nos. 1610 and 1612), and further results are now included for 1957 and 1958. By means of statistical analysis, studies were made of the relations between the primary production of nannoplankton and the duration of sunshine; intensity of the visible radiation of the sun and the sky, including the compensation intensity of the light; total intensity of the radiation of the sun and the sky; height of the sun above the horizon; individual components of solar radiation; and sunspots. Some of the relations are shown graphically. The results are also discussed in relation to information published previously (a list of references being appended) and to their implications in the control of problems caused by phytoplankton blooms in reservoirs. It is concluded that the development of phytoplankton could be predicted on the basis of the observed relation between primary production of phytoplankton and solar radiation; a method for the automatic measurement of phytoplankton counts in reservoirs can be based on the statistically significant relation between the primary production of phytoplankton and the compensation intensity of the light; and information can be deduced for use in planning the best procedures for control of phytoplankton, including the best time for applying algicides.

5293. Albrecht, M. L. 1959. QUANTITATIVE INVESTIGATION OF THE BOTTOM FAUNA OF FLOWING WATERS (METHODS AND RESULTS). Z. Fisch., 8 (N.F.), 481-550; LitBer. Wass. Abwass. Luft u. Boden, 1960, 9, 176-177; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 664. 1962.

The author gives a critical survey of literature on the quantitative determination of the bottom fauna of flowing waters. The difficulties of sampling in flowing waters, the various methods used for different substrates, methods of treatment of the collected material, and the influence of various natural and artificial variations in conditions and environment are discussed.

5294. Ambuhl, H. 1959. THE IMPORTANCE OF FLOW AS AN ECOLOGICAL FACTOR. PHYSICAL, BIOLOGICAL, AND PHYSIOLOGICAL INVESTIGATIONS ON THE NATURE AND EFFECT OF CURRENT IN FLOWING WATERS. Schweiz. Z. Hydrol., 21, 133-264; LitBer. Wass. Abwass. Luft u. Boden, 1960, 9, 180; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 665. 1962.

The author deals with the various types of flow and their effect on the life of a stream. He then considers the distribution of organisms in a flowing stream and the influence of currents on the qualitative and quantitative composition of the flora and fauna. The results of many investigations show that the fauna of a chemically homogeneous stream is composed of a "mosaic" of populations, distinguished less by their type composition than by the numbers of individuals of the different types. The composition is largely determined by flow as different types prefer different rates of flow. The physiological effects of flow were examined by measurements of respiration of Ephemeroptera and Trichoptera larvae in an endless pipe system at different rates of flow. It is shown that the respiration of the larvae is dependent on the oxygen content and the rate of flow, the effect of rate of flow depending on the renewal of oxygen in the boundary layer.

5295. Truelle, M. A. 1957. DAMAGE TO FISH CAUSED BY PESTICIDAL PREPARATIONS. Ann. Czech. Acad. agric. Sci., Ser. Anim. Prod., 2, 429-432; Sci. Pap. Inst. chem. Technol., Prague, Fac. Technol. Fuel Wat., 1960, 4, Pt. 2, 491; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 786. 1962.

The pesticidal preparations Nitrosan (consisting principally of dinitro-o-cresol), Emuldrin, and Kuprikol were found to be very harmful to fish. Perch died on exposure for a relatively short period to a concentration of 1 p.p.m. Nitrosan, and carp died when the concentration reached 5 p.p.m. The harmful effects occurred with substantially higher concentrations of Emuldrin and Kuprikol than of Nitrosan.

5296. Lüdemann, D., and H. Neumann. 1960. EXPERIMENTS ON THE ACUTE TOXIC EFFECT OF MODERN CONTACT INSECTICIDES ON ONE-YEAR CARP (CYPRINUS CARPIO L.). Z. angew. Zool., 47, 11-33; LitBer. Wass. Abwass. Luft u. Boden, 1960, 9, 178; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 789. 1962.

Results are given of experiments made to determine the lethal concentrations to one-year-old carp of a number of insecticidal preparations, including chlorinated hydrocarbons and organic phosphorus compounds. The chlorinated hydrocarbons were considerably more toxic than the phosphorus compounds. In the early stages of poisoning, fish affected by chlorinated hydrocarbons showed considerable agitation, a symptom not observed with phosphorus compounds. Damage by hydrocarbons was not reversible but fish, if transferred to pure water in time, recovered from the effect of phosphorus compounds.

5297. Denzer, H. W. 1959. MEMORANDUM ON DAMAGE TO FISHERIES BY WASTE WATERS. I. THRESHOLD VALUES FOR FISH AND ORGANISMS ON WHICH FISH FEED. Landesanstalt für Fischerei Nordrhein-Westfalen, 78 pp.; LitBer. Wass. Abwass. Luft u. Boden, 1960, 9, 180-181; Water Pollution Abstracts, Vol. 35, No. 4, Abst. No. 793. 1962.

The author has collected, from his own investigations and from the literature, information regarding substances harmful to fish and to organisms forming the food of fish. Methods of testing the effects of waste waters and the meaning and determination of the threshold value are described. The main part of the book is devoted to the threshold values of all the important harmful chemical compounds occurring in waste waters. These are given in alphabetical order with, in each instance, the threshold of disturbance for carp and rainbow trout and the critical threshold for Gammarus, Epeorus, Tubifex, Chironomus, Vorticella, and Paramecium. The characteristic symptoms of damage are described.

5298. Knudsen, George J. (Wisconsin Conservation Department, Madison). 1962. RELATIONSHIP OF BEAVER TO FORESTS, TROUT AND WILDLIFE IN WISCONSIN. Wisconsin Cons. Dept., Technical Bulletin No. 25, 52 pp.

During the period 1950 to 1958, 353 beaver ponds were visited and detailed observations were made of many ecological relationships between beaver and trout habitat, forests and other wildlife species. A standard procedure was developed for the study of each pond involving primarily a quiet approach, an observation period of one hour or longer from a good vantage point and then a complete circuit of the pond in order to observe and record pertinent data.

The typical sequence of habitat alterations resulting from beaver impoundments involves four stages of floodplain change. Before impoundment the floodplain is covered with lowland timber and shrubs or open grass areas (beaver meadows or areas that were clear-cut by loggers). Immediately following construction of the beaver dam, the original floodplain tree-shrub-grass communities are drowned and the pond produces typical though usually sparse communities of aquatic and emergent plants. The third stage occurs when the beaver pond is drained and the pond basin reverts to verdant sedge-grass meadow. The fourth stage follows, characterized by the gradual recovery of the floodplain to the shrub community and finally to the original timber community.

It is during beaver impoundment (stage 2) in which the most rapid and pronounced habitat changes occur. Here a paradox exists, for trout habitat is most seriously affected and timber is drowned while at the same time wildlife habitat is improved and wildlife is produced, often in abundance, on the beaver pond.

The findings of this study support the conclusions in the literature that beaver impoundments on slow-flowing trout streams do much more harm to trout habitat than good.

A special beaver-trout-forestry committee of Wisconsin Conservation Department personnel agreed that trout and forestry values on many specific areas outweighed the values of the beaver ponds, but that the overall economic and aesthetic values of the beaver ponds were much greater than previously believed. This animal, therefore, should be carried at optimum levels in the many areas within its range where it will not conflict to a great degree with trout and forestry interests.

Specific recommendations made by this committee, based on the beaver-pond study, involved a classification of areas in which beaver should be controlled in accordance with fish and forest management interests and areas in which beaver should be kept at optimum numbers. (Auth.)

5299. Chadwick, Harold K. (Inland Fisheries Br., California Dept. of Fish and Game, Sacramento). 1962. CATCH RECORDS FROM THE STRIPED BASS SPORTFISHERY IN CALIFORNIA. California Fish and Game, Vol. 48, No. 3, pp. 153-177.

Catch records from a party boat fishery and postal card surveys are examined to determine the status of California's striped bass population during the period 1949-1959. This paper supplements an earlier paper covering the party boat fishery for the period 1938-1948, and several papers reporting postal card survey results.

Total reported party boat fishing has remained quite constant over the 22-year period, although there have been major changes in various segments of the fishery. The chief changes since 1948 have been a decline in the importance of the Delta fishery, between 1952 and 1959, and a great increase in the northern San Francisco Bay fishery associated with changes in fishing methods in 1957.

A gradual decrease in fishing success during the late 1940's and early 1950's is indicated by both catch records. During this same period, the number of anglers increased, and these facts are

interpreted as indicating that the population itself declined during this period.

The trend in fishing success reversed after 1956 indicating an increase in population size.

The average size of the fish caught also decreased during the 1949-1959 period, probably indicating an increase in the harvest rate. (Auth.)

5300. Craig, William L. (Marine Resources Operations, California Dept. of Fish and Game, Sacramento). 1961. THE 1960 PRESEASON ALBACORE SURVEY IN THE NORTHEASTERN PACIFIC OCEAN. California Fish and Game, Vol. 48, No. 3, pp. 179-198.

The 1960 preseason survey of the northeast Pacific albacore fishing grounds was conducted from May 23 to June 18, 1960, by the Department of Fish and Game vessel N. B. Scofield (Cruise 60S3).

The oceanographic program was planned and coordinated jointly by the California Department of Fish and Game and the U. S. Bureau of Commercial Fisheries, Biological Laboratory, San Diego.

The area surveyed was bounded roughly by lat. 30° to 38° N., and long. 134° W. and the Channel Islands off California.

Surface trolling was used to locate albacore schools.

Except for one bigeye tuna the catch was entirely albacore. Of 153 landed 74 were tagged and released. At least an additional 50 albacore and five bigeye tuna were hooked but not landed.

Sea temperatures were measured from the surface to as deep as 700 feet and water samples for salinity determination were collected from approximately 33 feet (10 meters). Surface temperatures within the areas of catch ranged from 59.5 to 64.2 degrees F. and salinities from 32.95 to 33.53 parts per thousand.

The relationship between sea temperature and salinity indicated catches were restricted to the water mass of the California Current system. (Authors)

5301. Smith, Albert C. (Marine Resources Operations, California Department of Fish and Game, Sacramento). 1962. THE ELECTROPHORETIC CHARACTERISTICS OF ALBACORE, BLUEFIN TUNA, AND KELP BASS EYE LENS PROTEINS. California Fish and Game, Vol. 48, No. 3, pp. 199-201.

Electrophoresis of California bluefin tuna and kelp bass soluble lens proteins separated them into two components having characteristic curves which appeared to be identical for both species. A single component was demonstrated from albacore lenses.

No intraspecific pattern variations were considered important enough to reflect genetic differences between individuals of the same species, but they may be discovered when larger samples are tested. Such a discovery would provide a practical method of identifying separate, noninterbreeding populations of fish. (Auth.)

5302. Schneider, Hans (Hydrobiology Laboratory, Univ. of Wisconsin, Madison). 1962. THE LABYRINTH OF TWO SPECIES OF DRUMFISH (SCIAENIDAE). Copeia, 1962, No. 2, pp. 336-338.

An anatomical study of the labyrinth of Aplodinotus grunniens and Micropogon furnieri revealed the basic pattern with some specific features: the hearing part is very large and contains a regularly shaped otolith bearing a typical structure. The extensive macula sacculi is enervated by a voluminous nerve. No open connection exists between the pars inferior and pars superior. A special process attaches the pars superior to the skull in Aplodinotus, while in Micropogon an apex only takes its place. Since sound production is common in both species, the development of the hearing part of the labyrinth leads to the conclusion that the animals may well be able to utilize their acoustic signals. (Auth.)

5303. Minckley, W. L., and James E. Craddock (Dept. of Zool., Univ. of Louisville, Louisville, Kentucky). 1962. A NEW SPECIES OF PHENACOBIUS (CYPRINIDAE) FROM THE UPPER TENNESSEE RIVER SYSTEM. Copeia, 1962, No. 2, pp. 369-377.

Phenacobius crassilabrum, a new species of fine-scaled minnow previously identified with P. catostomus Jordan, is described from the upper Tennessee River System, and is compared with other southeastern representatives of the genus (P. uranops Cope, P. teratulus Cope, and P. catostomus). The most trenchant characters distinguishing P. crassilabrum from those species are the length of its pelvic fins (reaching past the anus), the number of scale rows around the caudal peduncle (20), and a distinctive color pattern. The possible origins and relationships of P. crassilabrum, and of the genus Phenacobius, are discussed. (Authors)

5304. Holčik, Juraj, and J. J. Duyvené de Wit (Laboratory of Ichthyology, Czechoslovakian Academy of Agricultural Sciences, Bratislava, Czechoslovakia). 1962. CHARACTERISTICS OF RHODEUS OCELLATUS AND ACHEILOGNATHUS LANCEOLATUS HYBRIDS. Copeia, 1962, No. 2, pp. 377-390.

The taxonomic characteristics of both reciprocals of the artificially produced hybrids between Rhodeus ocellatus and Acheilognathus lanceolatus are described. The parental species belong to the subfamily Acheilognathinae (Cyprinidae, Teleostei) and have their origin in Japan. Both kinds of intergeneric hybrids were raised to the adult stage. All of them showed a male phenotype, except for some neuters. In the breeding season, the male phenotypes displayed full nuptial colors and spawning behavior, but milt production was impaired. With respect to meristic counts, both kinds of hybrids were more similar to A. lanceolatus than to R. ocellatus. Except for the normal features common to both of the parents, the hybrids show also the atavistic features. The manifestations of hybrid atavisms in the sense of Mikoljukin's theory (1948 and 1952) were observed in the increasing number of teeth and

rows of teeth on pharyngeals, and in the extremely high dorsal fins. A. lanceolatus exhibited the greater influence in both combinations of hybrids; hence it is possible that this species is probably phylogenetically older than Rhodeus ocellatus. (Authors)

5305. Behnke, R. J., Ting Pong Koh, and P. R. Needham (Dept. of Zool., Univ. of California, Berkeley). 1962. STATUS OF THE LANDLOCKED SALMONID FISHES OF FORMOSA WITH A REVIEW OF ONCORHYNCHUS MASOU (BREVOORT). Copeia, 1962, No. 2, pp. 400-407.

Five salmonid specimens were collected from a mountain stream in Formosa in 1960. They suggest a close affinity to Oncorhynchus masou (Brevoort) and are considered to represent a subspecies of masou. In 1919, Jordan and Oshima described Salmo formosanus from Formosa. A specimen at Stanford University, listed as a paratype of Salmo formosanus, has basibranchial teeth, a character found in no species of Oncorhynchus. This specimen may actually represent a species of Salmo. The type specimen of Salmo formosanus cannot be located. It is not known how many salmonid species occur on Formosa. A list of taxonomic characters is given for O. masou. (Authors)

5306. Miller, Rudolph J. (Zoological Laboratory, Univ. of Groningen, Netherlands). 1961. REPRODUCTIVE BEHAVIOR OF THE STONEROLLER MINNOW, CAMPOSTOMA ANOMALUM PULLUM. Copeia, 1962, No. 2, pp. 407-417.

Nest-building, territory defense, and spawning of Campostoma anomalum pullum (Agassiz) occur from mid-April to early June at water temperatures of 58° to 75° F in the vicinity of Ithaca, New York. In shallow, gravel bottomed areas with slow to moderate currents males carry out most digging, stone carrying, and agonistic activities. Digging and stone carrying result in the formation of cleared areas often containing pits that are utilized in spawning. Males move from pit to pit, defending each area while they work in it. Where nest sites are limited and large numbers of males are present, the size of the defended territory decreases, or territoriality ceases for short periods. At times males carry out these activities in riffles without constructing nest pits. Females gather in schools in deeper water or backwaters near the nesting areas. When ready to spawn, a female enters a pit where the resident male and sometimes some peripheral males crowd against her while eggs and sperm are released. Neither males nor females are attached to a given nest pit, both sexes commonly moving from pit to pit for spawning purposes. Males, however, typically spend several minutes digging in each pit whereas females are in the pit only for the extremely brief duration of the spawning act. Aggression consists of either a frontal attack of variable intensity or partly ritualized behaviors which involve males brushing against each other's tubercles until one flees. (Auth.)

5307. Ali, M. A. (Dept. of Biology, University of Montreal, Canada). 1961. INFLUENCE OF LIGHT INTENSITY ON RETINAL ADAPTATION IN ATLANTIC SALMON (SALMO SALAR) YEARLINGS. Canadian Journal of Zoology, Vol. 40, No. 4, pp. 561-570.

Retinae of fish exposed to 9×10^2 ft-c are more fully adapted to light than those of fish exposed to 10^{-1} ft-c. Retinae of the former group take a shorter time to attain the same state of adaptation as that of the latter. However, they take a longer time than the latter to attain their own maximum state of adaptation. Retinae of fish subjected to darkness after exposure to 9×10^2 ft-c are not dark-adapted even after 70 minutes. The retinal epithelial pigment of fishes placed in darkness from light of 10^{-1} ft-c dark-adapts in 45 minutes while the cones do so in 25 minutes. The retinal index indicates that dark-adaptation occurs 45 minutes after subjection to dark. Hypotheses presented in a previous paper are discussed in the light of these results. (Auth.)

5308. Henderson, Nancy E. (Department of Zoology, Univ. of Toronto, Canada). 1962. THE ANNUAL CYCLE IN THE TESTIS OF THE EASTERN BROOK TROUT, SALVELINUS FONTINALIS (MITCHILL). Canadian Journal of Zoology, Vol. 40, No. 4, pp. 631-641.

The annual cycle in the testis of the eastern brook trout can be divided into six stages. A histological description is given of each of these stages and of the structure of the gonad. Primordial germ cells are always present in the lobules and so provide a permanent source of spermatogonia. The lobule boundary cells remain quiescent throughout a major part of the reproductive cycle, but become highly vacuolated during the latter half of the period of functional maturity. During the period of involution, phagocytes invade the seminiferous lobules and efferent ducts and ingest the residual sperm. The typical glandular interstitium of higher vertebrates is not present in this species. A gland-like structure is contained in the sperm duct, of which the function is unknown at the present time. (Auth.)

5309. Belyaeva, V. N., and I. V. Nikonorov. 1961. WHY LIGHT ATTRACTS FISH. (O PRICHINAKH PRIVLECHENIYA RYB NA SVET.) Vopr. Ikhtiol. 1(3): 513-518; Referat. Zhur., Biol., 1962, No. 3160; Biological Abstracts, Vol. 39, No. 1, Abst. No. 556. 1962.

The approach of fish to a light source is an investigative reflex whereas the general reaction of fish to light in general is an orienting-investigatory reaction. The reaction of fish to light is not constant, but changes depending on the biological condition of the body, the kind of light source, and abiotic and biotic factors. When fish are caught by light, a condition of change in illumination should be selected such that the fish are attracted in the largest possible numbers and come close to the area of action of the fishing equipment.

5310. Assman, A. V. 1960. CHANGES IN THE ACCESSIBILITY OF CHIRONOMIDAE LARVAE WHEN EATEN BY FISH. (IZMENENIE DOSTUPNOSTI LICHINOK CHIRONOMIDAE PRI VYEDANII RYBAMI.) Izvest. Akad. Nauk SSSR Ser. Biol. 5. 670-685; Referat. Zhur., Biol., 1961, No. 20D267; Biological Abstracts, Vol. 39, No. 1, Abst. No. 635. 1962.

Observations were made in enclosures of kapron with 6-mm meshes; dimensions of enclosures were 2 m X 2 m X 1.5 m high, and they were located in ponds on fish farms of the Volga delta and in Moscow oblast. In June and July biomass and number of larvae in enclosures without fishes (controls) gradually decreased as a result of the flight of imagoes and other causes. In experiments with fishes the most intensive decrease in biomass and numbers was observed in enclosures with carp; decrease was a little smaller with bream, still smaller with roach, and with goldfish the biomass and number of larvae differed little from the controls. In controls the maximum biomass and numbers of larvae were observed in the surface layer of the bottom (0-3 cm). In enclosures with carp maximum biomass was observed in the underlying layer (3-6 cm) of bottom. Decrease in biomass and reduction in numbers of large larvae in the surface layer of the bottom is evidence of selective consumption of large larvae by fishes. Movement of large larvae into the deep layer of the bottom decreases their accessibility to fishes. Carp penetrate deeper into the bottom than do other fishes. Vertical distribution of larvae in the bottom is determined not only by their ecology and physiology, but also by the way they are eaten by fish.

5311. Egorova, T. V., F. V. Krogius, I. I. Kurenkov, and R. S. Semko. 1961. THE CAUSES OF FLUCTUATIONS IN THE NUMBERS OF ONCORHYNCHUS NERKA IN THE OZERNAYA RIVER. (PRICHINY KOLEBANII CHISLENNOSTI KRASNOI R. OZERNOI.) Vopr. Ikhtiol. 1(3): 439-447; Referat. Zhur., Biol., 1962, No. 3I43; Biological Abstracts, Vol. 39, No. 1, Abst. No. 641. 1962.

The spawning stock of sockeye salmon in the Ozernaya river consists of 7 age groups. The most numerous of the groups were those of 5- and 6-year-olds (4_2+ and 5_2+), which had spent 2 years in Lake Kuril at the source of the Ozernaya river. A specific characteristic of the Ozernaya River sockeye is their maturation later than those of other Kamchatka rivers. When their numbers are smaller, their maturation is quicker: in a large group, fish of the 4_2+ age group mature and there are more of them than there are of age group 5_2+. The size and weight of sockeye going to spawn at the mouth of the Ozernaya river had increased by the end of the 1950's as a result of a higher growth rate of the fish following a great reduction in their numbers by the large Japanese fishing industry. A number of other biological parameters changed: the relative number in the age group 4_2+ increased, while those of 5_2+ decreased; the proportion of females in the population increased; the mean fecundity decreased from 3520 to 3410 eggs. The principal factor determining the number of fish in the different year-classes of sockeye is the number which did not spawn in the lake. Data for many years are given on the size, weight, fertility, size of the spawning population, and numbers of smolts produced. The optimum number of sockeye spawning in the lake should be 2,500,000 to 3,500,000. The size of the brood from this many parents is more than 6,000,000 fish, with a possible maximum of 10,000,000. The productivity of the young is also determined by the productivity of two spp. of plankton crustaceans, Cyclops strenuus Fish and Daphnia hyalina Leyd. As a result of Japanese fishing an insufficient number of spawning fish (500,000 in 1958) have arrived in Lake Kuril in the last few years. Measures to increase the number of fish spawning (almost complete protection for them in the USSR) has not led to an improvement of the large schools because of the continuation of large-scale Japanese fishing. A considerable portion of the fishes going up for spawning (130,000 to 320,000 from 1957 to 1959) did not actually spawn because of injuries received during temporary holding in Japanese drift nets.

5312. Protasov, V. R. 1961. THE REACTION OF FISH TO LIGHT IN RELATION TO SPECIFIC CHARACTERISTICS OF THEIR LIGHT PERCEPTION. (O REAKTSIYAKH RYB SVET V SVYAZI S OSOBENNOSTYAMI IKH SVETOVOSPRIYATIYA.) Vopr. Ikhtiol. 1(3): 519-532; Referat. Zhur., Biol., 1962, No. 3I61; Biological Abstracts, Vol. 39, No. 1, Abst. No. 668. 1962.

The scale of sensitivity to light is different in different species of fishes: this is related to the kind of illumination at their habitats. The color vision of fish changes in relation to the adaptation of their eyes to light or darkness. The threshold sensitivity of the fish's eye to the brightness of color depends on the previous adaptation of the retina to the light or dark. Fish may have color vision but be deprived of it (colorblind fish). The wide practice of using incandescent lights to lure fish for catching does not yet have an adequate biological foundation. The author considers the luring of fish toward the light as a process consisting of 2 stages: one of biological vision, when the light is a natural signal of school formation and of food; and of unnatural vision, when the exceptionally strong light exerts a luring action because of the adaptation mechanism. The movement of fish toward an artificial underwater light is considered to be both a manifestation of a biologically expedient reaction, and also a visual reaction as its mechanism.

5313. Skalkin, V. A. 1961. OTOLITHS OF FISHES OF THE COD FAMILY (GADIDAE) OF THE FAR EASTERN SEAS. (OTOLITY TRESKOVYKH RYB (SEM. GADIDAE) DAL'EVOSTOCHNYKH MOREI.) Vopr. Ikhtiol. 1(2): 286-289; Referat. Zhur., Biol., 1962, No. 319; Biological Abstracts, Vol. 39, No. 1, Abst. No. 4078. 1962.

Otoliths are described in the Far Eastern (Siberian) cod (Eleginus gracilis), the Pacific cod

(Gadus morrhua macrocephalus), and the pollack (Theragra chalcogramma). A survey is made of the position of the otolith in the auditory capsule, and terminology for describing otoliths is suggested. The author gives vertical cross-sections of otoliths of these fishes, a table comparing the general body dimensions with the size of the otoliths, and a table for the determination of gadoid fishes according to their otoliths. The author considers that the otoliths of some fishes may serve as a reliable taxonomic indicator the use of which is especially valuable in classifying the remains of fishes from the digestive tracts of animals and fishes, since the otoliths retain all their specific morphological and structural characteristics even through direction.

5314. Pearcy, William G. (Dept. of Oceanography, Oregon State University, Corvallis). 1962. ECOLOGY OF AN ESTUARINE POPULATION OF WINTER FLOUNDER PSEUDOPLEURONECTES AMERICANUS (WALBAUM). I. HYDROGRAPHY OF THE MYSTIC RIVER ESTUARY. Bulletin of the Bingham Oceanographic Collection, Vol. 18, Article 1, pp. 5-15.

The Mystic River estuary, in eastern Connecticut, is small, only 8.5 km in length, and its tidal prism is 38% of the volume at mean high water (11.4×10^6 m^3). The recorded temperature in the channel during 1958-59 ranged from -0.8 to 25° C, with seasonal warming and cooling taking place more rapidly in the upper than in the lower estuary. Salinity at the mouth averaged 30 0/00 and decreased toward the head. Vertical salinity stratification became more pronounced landward, indicating a well developed two-layer transport system in the upper estuary. Current profiles also displayed vertical differences that reflected two-layer transport. The exchange ratio for the upper estuary during the spring, calculated from net current velocities, volume of freshwater influent, and morphometric measurements, is estimated to be 0.6. (Auth.)

5315. Pearcy, William G. (Dept. of Oceanography, Oregon State University, Corvallis). 1962. ECOLOGY OF AN ESTUARINE POPULATION OF WINTER FLOUNDER PSEUDOPLEURONECTES AMERICANUS (WALBAUM). II. DISTRIBUTION AND DYNAMICS OF LARVAE. Bulletin of the Bingham Oceanographic Collection, Vol. 18, Article 1, pp. 16-38.

In weekly plankton collections of winter flounder larvae from February through June 1959 at seven stations in the Mystic River estuary, larvae were common from March to June. They were most abundant in the brackish waters of the upper estuary during March and April when densities were often over $10/m^3$; later in the spring, the bulk of the population was found in the lower estuary.

Vertical distribution studies revealed that larval densities near the bottom were about six times those near the surface; and laboratory observations disclosed that the larvae have a mixed planktonic and benthonic behavior. On the basis of larval distribution and estuarine circulation, it has been calculated that currents removed 3% of the population per day from the upper estuary, about one-third the loss that would be expected if there were uniform vertical distribution. The concentration of larvae near the bottom and in the upper estuary, where a countercurrent was apparent, is believed to be a major factor in reducing offshore dispersal. Variations in vertical and size distribution are explained by differences in circulation and by the weaker swimming ability of small larvae.

The post-recruit catch curve, constructed from the size-frequency distribution of over 3000 larvae and growth data, is concave, indicating high losses early in larval life followed by gradually decreasing loss rates with age. The estimated loss rate for small larvae is 20% per day as compared to only 4% for postlarvae. Both natural mortality and translocation are higher for young larvae. Natural mortality, however, is deduced to be the major component of total losses and of the age-specific differences in the loss rates.

Sarsia tubulosa medusae preyed on flounder larvae, and their distribution in time and space was similar to that of the larvae. Assuming a lesser ability of small larvae to evade and escape the medusae, a differential predation rate is postulated that helps to explain the relatively high mortality rates for small larvae.

Since the adult winter flounder spawns in estuaries and inlets along the coast and since the young stages are nondispersive, the breeding and nursery grounds are localized in the same area. Several ecological relationships concerning the inshore breeding habits of this species are discussed. In addition, similarities in the biology of other flatfish known to lay demersal eggs are pointed out. (Auth.)

5316. Pearcy, William G. (Dept. of Oceanography, Oregon State University, Corvallis). 1962. ECOLOGY OF AN ESTUARINE POPULATION OF WINTER FLOUNDER PSEUDOPLEURONECTES AMERICANUS (WALBAUM). III. DISTRIBUTION, ABUNDANCE, GROWTH, AND PRODUCTION OF JUVENILES; SURVIVAL OF LARVAE AND JUVENILES. Bulletin of the Bingham Oceanographic Collection, Vol. 18, Article 1, pp. 39-64.

The juvenile flounder of age-groups 0 and I in the Mystic River estuary were sampled quantitatively by trawling. The average population density was high, reaching values of over $1/m^2$ for age-group 0 in the spring. Juvenile growth was rapid during the warm seasons. Variations in density and growth were calculated on a monthly basis and were used to estimate net productivity. Production for both age-groups was maximal in late summer and fall, and minimal in the winter when both density and growth were low. Annual juvenile production was high, 3.7 g/m^2; the average biomass was 1.44 g/m^2.

Average monthly mortality, estimated from a catch curve for periods of comparable availability, equaled 31% for age-group 0 and 8% for age-group I. The data for mortality of both larvae and juveniles are summarized in a survival curve. The lowest survival rates are for early larval stages followed

by gradually increasing survival rates throughout the remainder of the early life history. Total mortality during the larval and juvenile stages was approximated at 99.98-99.99%.

The "critical period" concept is discussed; it has limited usefulness in a description of mortality, especially during the early life history of the winter flounder. (Auth.)

5317. Pearcy, William G. (Dept. of Oceanography, Oregon State University, Corvallis). 1962. ECOLOGY OF AN ESTUARINE POPULATION OF WINTER FLOUNDER PSEUDOPLEURONECTES AMERICANUS (WALBAUM). IV. FOOD HABITS OF LARVAE AND JUVENILES. Bulletin of the Bingham Oceanographic Collection, Vol. 18, Article 1, pp. 65-78.

Empty stomachs in larval winter flounder ranged from 72% for small postlarvae to 25% for metamorphosing larvae. In contrast, only 6% of the juveniles had empty stomachs. Nauplii, polychaetes, and invertebrate eggs appeared frequently in larval stomachs, as did many small protozoan-like animals that could not be positively identified. The predominant food for metamorphosing larvae and for juveniles up to 10 mm in length was harpacticoid copepods, and for age-group 0 juveniles until August, calanoid copepods. After this time amphipods and polychaetes were most important. Polychaetes became increasingly important by volume with age. Ampelisca and Neanthes were the two most important prey of juveniles.

The juveniles were euryphagus; 77 food organisms from seven phyla were identified. A high degree of food selectivity was indicated at certain times of the year; for example, when large numbers of calanoid copepods were found in year-old flounder.

Winter flounder fed primarily by day. It is estimated that stomachs of age-group 0 during the summer normally emptied during the night, or in about eight hours. (Auth.)

5318. De Sylva, Donald P. (Institute of Marine Science, University of Miami, Miami, Florida). 1962. RED-WATER BLOOMS OFF NORTHERN CHILE, APRIL-MAY 1956, WITH REFERENCE TO THE ECOLOGY OF THE SWORDFISH AND THE STRIPED MARLIN. Pacific Science, Vol. XVI, No. 3, pp. 271-279.

Surface temperatures and bathythermograph readings were taken, and observations on the distribution of several marine organisms were made in April and May 1956 over a relatively small area north and south of Iquique, Chile, and seaward to about 60 nautical miles in the Peru Coastal Current.

The area is characterized by a narrow continental shelf with deep water close to shore and complex coastal currents, with a drift of warm water from the north superimposed upon upwelled cool water.

Admixture of these two bodies of water appeared to favor the growth of dinoflagellates ("aguaje"), which in turn supported a food web of copepods, zoea, euphausiid shrimp, anchovies, bonito, and squids.

The concentrations of squids, bonito, and anchovies, as foods of swordfish and marlin, are thought to be an indirect result of the productivity caused by the juncture of the two currents.

The distribution of the swordfish and marlin in northern Chile, based on personal sightings and records from fishermen, is discussed in relation to ecological conditions. (Auth.)

5319. Major, Richard L., and Donovan R. Craddock (Bur. of Commercial Fish., U. S. Dept. of the Interior, Washington, D. C.). 1962. INFLUENCE OF EARLY MATURING FEMALES ON REPRODUCTIVE POTENTIAL OF COLUMBIA RIVER BLUEBACK SALMON (ONCORHYNCHUS NERKA). U. S. Fish and Wildlife Service, Fishery Bulletin 194, Vol. 61, 9 pp.

Early maturing fish that have spent only one year in the ocean are common in the spawning escapements of Columbia River blueback salmon, Oncorhynchus nerka, particularly in the Okanogan tributary. The unusually high incidence of these 1-year-ocean fish in 1953, however, led to a study to determine the average fecundity of the ocean-age groups composing the runs, and to assess the effect of varying age and sex composition on estimates of reproductive potential.

A fecundity study in 1957-59 revealed that the average egg content of 1-year-ocean females was approximately one-third less than that of 2-year-ocean females. The average egg content of 3-year-ocean females was, in turn, about one-fourth greater than that of 2-year-ocean females.

Analysis of the age group fecundity and sex ratio data showed that the number of spawners or even female spawners does not always accurately portray the reproductive potential of an escapement. Erroneous reproduction estimates seriously distort escapement-return relationships. (Authors)

5320. Jensen, Albert C., and John P. Wise (Bur. of Commercial Fisheries, U. S. Department of the Interior, Washington, D. C.). 1962. DETERMINING AGE OF YOUNG HADDOCK FROM THEIR SCALES. U. S. Fish and Wildlife Service, Fishery Bulletin 195, Vol. 61, 12 pp.

The history of age determinations of haddock from various areas is discussed, with a resumé of the previous work in New England and adjacent areas. Various methods of validation of age determination of haddock in New England waters are considered and evaluated. It is concluded that scales provide a satisfactory indication of the age of these fish, particularly for their first 5 years. (Authors)

5321. Hida, Thomas S., Joseph R. Harada, and Joseph E. King (Bur. of Commercial Fisheries, U. S. Dept. of the Interior, Washington, D. C.). 1962. REARING TILAPIA FOR TUNA BAIT. U. S. Fish and Wildlife Service, Fishery Bulletin 198, Vol. 62, 20 pp.

The Hawaiian skipjack, Katsuwonus pelamis, fishery is often faced with an inadequate supply of live bait during the summer season when the

skipjack are plentiful. The Bureau of Commercial Fisheries experimented with the hatchery rearing of Tilapia mossambica in 1958 and 1959 at Paia, Maui, to determine if tilapia could be produced economically to supplement the supply of naturally occurring bait fishes.

A description of the hatchery and its operation and the results obtained are presented. From the information gained it is believed that a larger and better designed hatchery than the one in the study could produce bait economically and in adequate quantities. (Authors)

5322. Hilsenhoff, William L. 1962. TOXICITY OF GRANULAR MALATHION TO WALLEYED-PIKE FINGERLINGS. Mosquito News 22(1): 14-15; Biological Abstracts, Vol. 39, No. 2, Abst. No. 4627. 1962.

Tests were conducted for 24 hours at 14.5° C in aquaria containing 12 inches of water above a 2 1/2 inch layer of mud. Ten percent, 30/60 mesh, AA-RVM granular malathion caused significant mortality at 5 lb actual per acre, and no mortality at 2 lb per acre. (Auth.)

5323. Ide, F. P. (University of Toronto, Ontario, Canada). 1961. EFFECTS OF FOREST SPRAYING WITH DDT ON AQUATIC INSECTS, FOOD OF SALMON AND TROUT, IN NEW BRUNSWICK. Proc. Entomol. Soc. Ontario 91: 39-40; Biological Abstracts, Vol. 39, No. 2, Abst. No. 4631. 1962.

The recovery of the aquatic insect fauna, following forest spraying with half a pound of DDT per acre delivered in oil from planes, has been followed in tributaries of the Northwest Miramichi. By detailed sampling of emerging insects of the rapids it was found that the fauna of a small tributary recovered qualitatively in 4 years by comparison with the pre-spray fauna of the same stream. The fauna of 2 larger tributaries (further from the source) showed incomplete recovery after 6 years (1960), the caddis flies being represented by about 50% of the species of an unsprayed tributary of similar size and character used as a control. (Auth.)

5324. Kozhov, M. M., and N. V. Tyumentsev. 1961. THE BIOLOGIC CONSEQUENCES OF FLUCTUATIONS IN THE LEVEL OF LAKE BAIKAL. (O BIOLOGICHESKIKH POSLEDSTVIYAKH KOLEBANII UROVNYA BAIKALA.) Byull. Moskov Obshchestva Ispytatelei Prirody Otdel Biol. 66(3): 32-39; Referat. Zhur., Biol., 1962, No. 2Zh215; Biological Abstracts, Vol. 39, No. 2, Abst. No. 4639. 1962.

The absolute amplitude of fluctuation of the water level of Lake Baikal over a long period was 2.22 m. With the construction of the Irkutsk hydroelectric station on the Angara River, Lake Baikal assumed the role of a reservoir. It was found that in years when the water level of the lake was high the migration of fish into the rivers for spawning was assured, and the area of shallow grazing water for the fish was increased. In years when the levels of the lake water were minimal, reproduction of fish was impaired. It was further found that a lowering of the average water level of only 0.6 to 1.0 m for a period of several years will damage the fishing economy, since it will sharply decrease the area of shallow water (by more than 20,000 ha). With amplitude of fluctuation of 3-5 m, the low land area which is periodically flooded and dried will extend out to 10-18 km along some parts of the lake, and this will seriously damage the organization of the fishing industry. For the creation of optimal fishing conditions the maximal amplitude of the water level fluctuation over a long period should not exceed 2 m.

5325. Mann, Hans, and Otto J. Schmid (Univ. of Hamburg, Germany). 1961. THE INFLUENCE OF DETERGENTS UPON SPERM, FERTILIZATION AND DEVELOPMENT IN THE TROUT. (DER EINFLUSS VON DETERGENTIEN AUF SPERMA, BEFRUCHTUNG UND ENTWICKLUNG BEI DER FORELLE.) Internatl. Rev. Gesamten Hydrobiol. 46(3): 419-426; Biological Abstracts, Vol. 39, No. 2, Abst. No. 4646. 1962.

Eight detergents were tested to determine their effect on the motility of trout sperm. Concentrations necessary for harm to the sperm varied from 5 mg/l to 100 mg/l for the various detergents. The commercially most important detergents, korenyl and dodecylbenzolsulfonate had a detectable influence at concentrations of 5 mg and 10 mg/l respectively. Through the effect on sperm motility, detergents had a deleterious effect upon fertilization of eggs. Fertilized eggs cultured in solutions of dodecylbenzolsulfonate were 100% killed in a concentration of 5 ml/l after 35 days, in contrast to a 5% mortality in the controls. This concentration may be exceeded locally in polluted waters. (C. C. D.)

5326. Shentyakov, V. A. 1960. THE EFFECT OF AN AC ELECTRICAL FIELD AND A MECHANICAL IRRITANT ON THE BEHAVIOR OF FISH IN FRONT OF A TRAWL. (O POVEDENII RYBY PERED TRALOM PRO VOZDEISTVII NA NEE ELEKTRICHESKOGO POLYA PEREMENNOGO TOKA I MEKHANICHESKOGO RAZDRAZHITELYA.) Byull. Inst. Biol. Vodokhranilishch 8/9. 46-49; Referat. Zhur., Biol., 1961, No. 21D370; Biological Abstracts, Vol. 39, No. 2, Abst. No. 4674. 1962.

Based on an analysis of the behavior of fish, a selection was made of the most appropriate distance from the trawl to the boundary of that zone of the electrical field in which fish of a commercial size are stunned. The distance from the electrified trawl to the boundary of that zone determines the catch. When the electrical irritant was reinforced with a mechanical irritant a clear defensive reaction was manifested and the fish left the electrical field. The distance at which the fish respond to the movement of the trawl was determined experimentally. A test of the effectiveness of the mechanical irritant was made on a symmetrical trawl having a page of 22 m and wings 14 m long. On the ground line a 24-electrode electric cord was installed, insuring the approach of the margins of the stunning zone for 30-cm bream at a distance of about 2.5 m

from the ground rope along the symmetrical axis of the trawl. A mechanical irritant additional line was used, attached to stay planks at the ends and also about 2.5 m in front of the ground rope. With this arrangement in the summer of 1958 a series of staggered drags was carried out in the Rybinsk Reservoir with electric current and, as control, without current (in all, 20 drag). Results disclose almost no difference in catches with current and without current, in numbers and weight. With the removal of the line which was the mechanical irritant in the electrical field in front of the trawl, the catches were 215% of control catches by weight and 176% by number. In the second series of experiments the irritant line was placed 1.5 m in front of the ground rope of the trawl and 1 m behind the border of the zone of stunning for the 30-cm bream. In this case, weight of catches did not increase, but the size of fish caught was greater. Correlation of data for distance at which bream begin reacting to the movement of the electrotrawl (1-2 m) with the transparency of the water (100-180 cm) supports the assumption that with the action of 2 irritants (electrical and mechanical) the principal determinant of the reaction of the bream to the movement of the trawl is maturity. For successful operation of the electrotrawl in Rybinsk Reservoir it is necessary that the edge of the zone of electrical irritation for bream of commercial size by 2 to 2.5 m in front of the ground rope.

5327. Yur'ev, G. C. 1961. MORPHOLOGY OF THE CARP (CYPRINUS CARPIO L.) IN THE PROLETARSKI RESERVOIR. (MORFOLOGIYA SAZANA (CYPRINUS CARPIO L.) PROLETARSKOGO VODOKHRANILISHCHA.) Vopr. Iktiol. 1(2): 243-252; Referat. Zhur., Biol., 1962, No. 11I; Biological Abstracts, Vol. 39, No. 2, Abst. No. 4688. 1962.

In this reservoir there are 3 ecological forms of carp, which differ in rate of growth and a number of morphological characteristics. Some of these may be hereditary. In a number of them a definitely measurable variability was established, and this variability persisted during all of the periods of growth. A significant amount of sexual dimorphism occurred in 2 forms of the yellow carp, as determined by relative measurements of the head, mouth, body circumference, lengths of pectoral and ventral fins and antedorsal space.

5328. Potvin, A.-R. (Laval University, Quebec, Canada). 1960. VENOMOUS STINGER OF CERTAIN FISH: ICTALURUS NEBULOSUS, ICTALURUS CATUS. STUDIES OF INFECTED WOUNDS. (AIGUILLON VENIMEUX DE CERTAINS POISSONS: ICTALURUS NEBULOSUS, ICTALURUS CATUS. RECHERCHES SUR L'ENVENIMATION DES PLAIES.) Laval Med. 28(4): 492-503; Biological Abstracts, Vol. 39, No. 2, Abst. No. 6294. 1962.

A study of the venomous stinger of certain fish: its origin, method of venom injection, chemical nature of the venom and its action on cells and tissues. The author presents a historical background of the existence of such fish since the days of antiquity with special emphasis on the Silurides or catfish. He describes the structure of the stinger, a bony part of the pectoral fin with a retractable "jack-knife" action. He presents various theories pro and con the existence of a veritable venom, with others maintaining that any infected wounds are due not to any venom, but to injuries due to the serrations on the fish stinger, climatic influences, etc. The author points out the many inconsistencies and uncertainties even today about the origin and method of injection of the venom, if one admits its existence. He believes the venom to come from a lymph gland near the base of the stinger and intends in the future to extract and analyze this liquid and then to inject it into various cells, animal tissues, laboratory animals, and even human beings in order to study the effects. (Auth.)

5329. Branson, Branley A. (Kansas State College, Pittsburg). 1961. OBSERVATIONS ON THE DISTRIBUTION OF NUPTIAL TUBERCLES IN SOME CATOSTOMID FISHES. Trans. Kansas Acad. Sci. 64(4): 360-372; Biological Abstracts, Vol. 39, No. 2, Abst. No. 8502. 1962.

The distribution and morphology of breeding tubercles is discussed in Cycleptus elongatus, Ictiobus, several Moxostoma, Hypentelium nigricans, Minytrema melanops, Erimyzon, Catostomus and Chasmistes brevirostris. The primitive condition is considered to be tubercles arranged in definite rows or bands; scattered tubercles is a phylogentic development. However, ethological investigations need to be carried out to determine the correlation between breeding and nesting habits and the distribution of these organs. (Auth.)

5330. Grinberg, M. M. 1961. THE ONTOGENESIS OF SCALES IN BONY FISH. (OB ONTOGENEZE CHESHUI U KOSTISTYKH RYB.) Zool. Zhur. 40(2): 234-243; Referat. Zhur., Biol., 1961, No. 24D484; Biological Abstracts, Vol. 39, No. 2, Abst. No. 6520. 1962.

A histologic study of the development of the scales of the salmon and crucian carp with complete ontogenetic series. The problems of the role of the epidermis and the corium in the development of scales, of the significance of the enamel organ, of recapitulations in the development of scales, etc., are discussed.

5331. Öztan, Nezihe (University of Istanbul, Turkey). 1960. THE EFFECTS OF GONADOTROPIC AND STEROID HORMONES ON THE GONADS OF STERILE HYBRID FISHES. Istanbul Univ. Fak Mecmuasi 25(1/2): 27-47; Biological Abstracts, Vol. 39, No. 2, Abst. No. 5818. 1962.

The sterility caused by hybridization and certain chromosomal constituents was cured by the administration of steroid (methyltestosterone, estradiol benzoate) and gonadotropic hormone (Anteron), as attested by the fact that sterile F_2R hybrids after treatment produced an F_3R generation. Colored F_3R males and females were again sterile.

The gonads of sterile F_2R-male hybrids that were treated with steroid or gonadotropic hormone were able to develop to the mature stage if they contained the primary germ cells. Males carrying X-gonosome became mature as well as the ones carrying Y- or Z-gonosome. Among the sterile F_2R-females Sd- and Sp- females were stimulated with gonadotropic hormone, whereas Sr- and R-females were not responsive. This result may be due to their gonosome mechanism. The former ones have X-gonosome carrying special genes modifying femaleness, the latter ones have Y- and Z-gonosomes carrying genes modifying maleness. The effect of steroid hormone is not so obvious as gonadotropic hormone in female hybrids. Sperm tubules and the vasa deferentia were especially sensitive to hormone administration and showed greatest changes. These structures may secrete steroid hormone under normal conditions. Steroid hormones were not effective on gonads which did not have germinal tissue. The histological structure of the gonads of treated and untreated sterile hybrids was studied. (Auth.)

5332. Russel, S. (University of Massachusetts, Amherst). 1962. ESTIMATING MARINE SPORT FISHERMEN. Biometrics 18(2): 265.

A procedure for estimating time spent fishing is described. Daylight hours were considered. The days of the year were allocated to three seasonal periods. Within periods, weekends and holidays were observed separately from weekdays. Plane counts were made on five randomly chosen days within each time subgroup for two seasonal periods. These instantaneous counts were expanded to daily totals. Expansion was done by using a daily pattern. The daily pattern was determined from ground observations made on two randomly chosen days within each of the subgroup times at each of six points along the coast. Ground observation made it possible to determine the proportion of all fishermen for the day which were present at the time of the plane count. Division, multiplication and addition were necessary in arriving at an aggregate estimate. The classical theorems for variance of quotients, products and sums were used. Using the 95 percent confidence level, the error was about 30 percent of the estimate. (Auth.)

5333. Major, Richard L., and Donovan R. Craddock (Bur. of Commercial Fisheries, Seattle, Wash.). 1962. MARKING SOCKEYE SALMON SCALES BY SHORT PERIODS OF STARVATION. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 416, 12 pp.

Experiments conducted at the Leavenworth, Wash., national fish hatchery in 1959 and 1960 demonstrated that the scale pattern of Columbia River sockeye salmon Oncorhynchus nerka can be recognizably modified by a short period of starvation. Modification was obtained with little mortality. Starved fish readily resumed feeding; and although they did not make up for lost growth, they regained their robustness and outward vigor.

The tests were the first in a series to determine whether a starvation-marking technique can be developed as a means of separating wild from hatchery-reared sockeye salmon. (Authors)

5334. Kuroki, Toshiro, and Kazumi Kumanda. 1961. THE EFFECTS OF UNDERWATER EXPLOSIONS FOR THE PURPOSE OF KILLING PREDACIOUS FISHES. Bulletin of the Faculty of Fisheries, Hokkaido University, Vol. 12, No. 1, pp. 16-32.

There is a cove in Ushine district at the north end of Tarumizu city in Kyushu where the Coastal Fisheries Promotion Association of Kagoshima-Bay proposed growing yellowtail, Seriola quinqueradiata. It was necessary that major fishes (common seabass, mullet, barracuda, etc., as predators) be annihilated before larval yellowtail were placed in the closed cove. Underwater dynamite explosions were carried out in 1960.

Injuries to fishes included congested lateral muscles, exposed entrails and destroyed opercula. Seriousness of injury depended on the distance from exploding point, but the relation was complex and it seemed, especially, that injuries to fish were serious near the sea surface.

Breakage of vertebrae or burst air bladders occurred often 15 m from an explosion and congested vertebral arteries were observed at 20 m or more.

In view of the relation "Peak pressure of explosion is directly proportional to the cube root of charged explosive mass", it is more effective to use a large number of charges of small mass. With 405 gr of dynamite (N.G. 50%) in every charge a large number of charges must be set at 7-10 m or less. (Authors)

5335. Fujii, Takeji, Shigeo Abe, Shoji Saito, Kiyoshi Masuda, and Shigekatsu Nakane. 1961. EXPLORATORY FISHING OF SALMON WITH GILL NETS OF VARIOUS MESH SIZES AND WITH A TRAMMEL NET IN ALEUTIAN WATERS 1957. Bulletin of the Faculty of Fisheries, Hokkaido University, Vol. 12, No. 2, pp. 129-137.

South of the eastern Aleutians, where the surface temperature was relatively high (8° C), chum salmon 3 years old were caught. In the cold water region adjacent to the Aleutians, large sockeye and chum salmon were caught. Pink salmon were rare.

Southwest of the Attu Islands, the body length of chum salmon did not differ from those caught three weeks previously. However, the number of large sockeye and chum salmon decreased in comparison with those caught 3 weeks before; the males dominated in the former sample, while the females dominated in the latter. Half of the fish in the first sample were immature, while nearly all fish were mature three weeks later. (Authors)

5336. Kubo, Tatsuro. 1961. NOTES ON THE BLOOD OF MASU SALMON, ONCORHYNCHUS MASOU, DURING UP-STREAM MIGRATION FOR SPAWNING, WITH SPECIAL REFERENCE TO THE OSMOCONCENTRATION. Bulletin of the Faculty

of Fisheries, Hokkaido University, Vol. 12, No. 3, pp. 189-195.

The seasonal changes in osmoconcentration and other characteristics of masu salmon blood during up-stream migration were studied.

At the beginning of migration when fish stay in the lower part of a river, the freezing point of their blood is slightly high, but tends to decline as the season progresses and the fish ascend the river. Then, a temporary rise occurs in fish whose sexual products are developing and, finally, falls markedly in fish which are ready to spawn.

The chloride content of blood shows the same fluctuation as that of the freezing point.

There is an apparent inverse correlation between the change of density and that of the water content of blood. These two characteristics may bear no direct relationship with the freezing point and chloride content. In contrast with blood of the inshore-migrating fish, that of fish during up-stream migration shows relatively high density and low water content. However, in the blood of the ripening fish, the reduction of the density and the increase of water content are obvious.

These changes of density and water content of blood may be induced by changes in protein content and other biochemical characteristics of blood. (Auth.)

5337. Hansen, Martin J. (Institute for Fisheries Research, Michigan Dept. of Conservation, Ann Arbor), and Don W. Hayne. 1962. SEA LAMPREY LARVAE IN OGONTZ BAY AND OGONTZ RIVER, MICHIGAN. The Journal of Wildlife Management, Vol. 26, No. 3, pp. 237-247.

Sea lamprey ammocoete populations were investigated in 146 acres of Ogontz Bay of Lake Michigan and in the contiguous 9.6 miles of Ogontz River, Delta County, Michigan, in 1958 and 1959. Population estimates were based upon stratified random sampling by means of an orange-peel dredge in the bay and a new enclosure method (described) in most of the river. The bay population was estimated to make up 18 percent of the total (167 thousand) in the bay-river system. Length frequencies suggest that the bay population was recruited from that in the river, and that survival might be relatively high in the bay. (Authors)

5338. Davis, Roger E. (Dept. of Fish., School of Natural Resources, Univ. of Michigan, Ann Arbor). 1962. DAILY RHYTHM IN THE REACTION OF FISH TO LIGHT. Science, Vol. 137, No. 3528, pp. 430-432.

Bluegills in a 24-hour light-dark cycle were exposed briefly to light at a random time in the daily dark period. The duration of the accompanying "lightshock reaction" daily became longer at times early in the dark period and shorter at times in the later hours of darkness. (Auth.)

5339. Marak, Robert R., John B. Colton, Jr., Donald B. Foster, and David Miller (Bureau of Comm. Fish., Woods Hole, Massachusetts). 1962. DISTRIBUTION OF FISH EGGS AND LARVAE, TEMPERATURE, AND SALINITY IN THE GEORGES BANK-GULF OF MAINE AREA, 1956. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 412, 95 pp.

Basic data on the distribution of fish eggs and larvae in the Georges Bank-Gulf of Maine area were collected on surveys made by the Bureau of Commercial Fisheries research vessel Albatross III during the spring of 1956. The data are presented in tabular and graphic form. Plots and tables of surface temperature and salinity are also included. (Authors)

5340. Tanaka, Syoiti (Tokaiku Suisan Kenkyujo, Tsukishima, Chuo-ku, Tokyo). 1962. THE EFFECT OF REDUCTION OF FISHING EFFORT ON YIELD. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 4, pp. 521-529.

When a fish population has been depleted by heavy exploitation, with the yield from the population maintaining an unfavorable level, it is usual to expect that the situation will be improved by reduction of fishing effort. Following a sudden reduction of fishing mortality, p, from p_1 to p_2 at time r = 0, the yield at once decreases and then increases gradually until it reaches another steady level higher than the former level.

The present paper deals, using Baranov's model, with the transition stage of the population following a sudden change in p, as well as with the steady state before and after the change. Relations between equilibrium yield and fishing mortality rate (effort-yield curves) are calculated for various values of the parameters, λ_o (= l_o/u, where l_o is the length of a recruit and u is the yearly increase in length), q (natural mortality rate), and b (remaining life span of a fish at the time of recruitment). It is noteworthy that for species that grow slowly after recruitment, i.e. when λ_o is large, reduction of fishing would have scarcely any effect on the yield.

Yield curves for the period of transition from the present to various lower levels of fishing are calculated for the case in which λ_o = 4, q = 0.15, b = 10 and p_1 = 1.35. These represent parameters for the present state of the stock of sohachi flounders Cleisthenes herzensteini (Schmidt), in the southwestern area of the Japan Sea.

Possible density effects on growth rate and natural mortality rate, which are briefly discussed, appear to diminish considerably the effectiveness of any reduction in fishing effort. (Auth.)

5341. Ricker, W. E. (Fish. Res. Bd. of Canada, Biol. Station, Nanaimo, B. C.). 1961. COMPARISON OF OCEAN GROWTH AND MORTALITY OF SOCKEYE SALMON DURING THEIR LAST TWO YEARS. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 4, pp. 531-560.

Average instantaneous rates of growth in weight of sockeye Oncorhynchus nerka of two stocks are computed for their last two growth-years, from scale measurements by Barnaby and Foerster.

Values from 0.081 to 0.156 per month are obtained. These rates greatly exceed a maximum estimate of instantaneous natural mortality rate, 0.038 per month, for the same period. The latter is based on the total rate of ocean mortality of large smolts, divided by the number of months they are at sea. On this basis, oceanic capture of sockeye during the year prior to their maturation yields less than 35% to 50% of the catch that would be taken from the same fish by a shore fishery the following year. Minimum estimates of loss from high-seas capture of major growth types of sockeye during the year of their maturation vary from 6% to nearly 40%, depending on how early in the season the fishing is done and the particular stock involved. While an increase in mortality rate as sockeye approach shore cannot be excluded, any resulting decrease in the estimate of loss among currently-maturing fish must be accompanied by an increase in the estimate of loss from capture in the year before maturity. In any event, a high-seas fishery that takes any significant fraction of non-maturing sockeye must markedly decrease the total yield from the stocks involved. (Auth.)

5342. Parker, Robert R. (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, B. C.). 1962. ESTIMATIONS OF OCEAN MORTALITY RATES FOR PACIFIC SALMON ONCORHYNCHUS. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 4, pp. 561-589.

A conceptual model representing natural marine mortality rates of Pacific salmon is developed. Ocean mortality rate (q) is taken as the base to which coastal mortality rates of juveniles (c) and of adults (k) are additive factors. The effect of marking is taken as a multiplicative factor (m) of the instantaneous rate (i) where $i = q + c + k$. Together with time these values are incorporated into the balanced equation

$$c + k = \frac{1}{m}(\mathrm{Ln}N_o - \mathrm{Ln}(R_1 e^{mt_0.1^q} + R_2 e^{mt_0.2^q} + R_3 e^{mt_0.3^q} + \cdots))$$

where N_o denotes the population entering the sea and R_1, R_2, R_3 denote the returns at succeeding times of maturity. The locus of $c + k = f(q)$ is used to graphically depict all possible combinations of $c + k$ and q within the limits (q, $c + k = 0$). Intersections of loci are taken as estimates of values of q and $c + k$ which satisfy two sets of data. Available data for sockeye salmon (O. nerka) from Cultus Lake, Chilko Lake and Hooknose Creek, British Columbia, Karluk River and Bare Lake, Alaska, and Dalnee River, Kamchatka, pink salmon (O. gorbuscha) and chum salmon (O. keta) from Hooknose Creek, chinook salmon (O. tshawytscha) from the coast of Southeast Alaska and coho (O. kisutch) from the Eel River, California, are utilized. It is concluded that ocean mortality is relatively constant, of the order of magnitude $q = 0.32$ or $S = 73\%$ annually. A juvenile coastal mortality factor (c) apparently exists and is characteristic of the species and race through the media of size of migrants, time spent in the coastal area, and geography. An adult coastal factor (k) may exist but is of negligible influence on the total mortality rate. While the data utilized collectively may be considered as extensive, serious defects in sampling errors and undefined variability were encountered. It is doubted that mortality rates can be more accurately defined from any repetition of experiments used, hence a more direct approach is indicated for solution of this problem. (Auth.)

5343. Jonas, R. E. E., Harcharan S. Sehdev, and N. Tomlinson (Fish. Res. Bd. of Canada, Technol. Station, Vancouver 8, B. C.). 1962. BLOOD pH AND MORTALITY IN RAINBOW TROUT (SALMO GAIRDNERII) AND SOCKEYE SALMON (ONCORHYNCHUS NERKA). Journal of the Fisheries Research Board of Canada, Vol. 19, No. 4, pp. 619-624.

Rainbow trout Salmo gairdnerii under light anaesthesia with MS 222 (tricaine methanesulphonate) died when their blood pH was lowered into the range of 6.8 to 6.9 by injection of either lactic acid or hydrochloric acid. When injection of the same quantities of either acid did not lower the blood pH into this range, fatalities did not result (one exception in 56 fish injected). The injection of much larger quantities of lactate or chloride ions in the form of sodium salts did not cause fatalities.

Very limited data for sockeye salmon Oncorhynchus nerka suggest a similar association between blood pH and mortality for this species. (Authors)

5344. Keenleyside, Miles H. A. (Dept. of Zoology, The Univ. of Western Ontario, London, Ontario). 1961. SKIN-DIVING OBSERVATIONS OF ATLANTIC SALMON AND BROOK TROUT IN THE MIRAMICHI RIVER, NEW BRUNSWICK. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 4, pp. 625-634.

Free-living Atlantic salmon and brook trout were studied at 12 locations in the Miramichi River, New Brunswick, by swimmers wearing skin-diving equipment. Juvenile salmon were found at all locations, but were most numerous in rapids in the river headwaters. Juvenile and adult trout were common in rapids and pools of the headwaters only. Small numbers of adult salmon were seen throughout the river, mostly in pools.

The following activities of both species are described: position maintenance relative to surroundings; social, feeding, escape and investigatory behavior.

The potential value of underwater swimming as a tool in fisheries research is briefly discussed. (Auth.)

5345. Lindsey, C. C. (Inst. of Fish., University of British Columbia, Vancouver, B. C.). 1961. DISTINCTIONS BETWEEN THE BROAD WHITEFISH, COREGONUS NASUS, AND OTHER NORTH AMERICAN WHITEFISHES. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 4, pp. 687-714.

176 specimens of C. nasus and 121 of "humpback" whitefish (allied to C. clupeaformis) were examined from 15 North American localities where

the two kinds occurred sympatrically. No previously published criteria were effective in separating the two kinds at all sizes in all localities, but combinations of certain pairs of measurements chosen to compensate for nonisometric growth allowed identification of all individuals examined. Length of longest gill raker was less than 20% of the interorbital width in all C. nasus, more in all "humpbacks". Means of 15 other proportional or meristic characters differed consistently between sympatric species pairs. C. nasus is a distinct and widespread species. Its distribution and nomenclature are reviewed. (Auth.)

5346. Scott, D. P. (Fish. Res. Bd. of Canada, Biol. Station, London, Ontario). 1961. EFFECT OF FOOD QUANTITY ON FECUNDITY OF RAINBOW TROUT, SALMO GAIRDNERI. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 4, pp. 715-731.

Studies of histology and development of rainbow trout ovaries indicate that the degree of follicular atresia is associated with degree of starvation during the maturation period. Experimental stocks raised under varying starvation regimes showed that the greater the starvation, the higher the proportion of maturing follicles which regressed. Thus the result was a lower number of eggs brought to maturity in starved fish.

Observations on natural populations indicate wide differences in egg size, with corresponding inverse differences in egg number at maturity. Egg size is apparently not affected by diet, but rather through natural selection depending on intraspecific competition. There appeared to be little correlation between egg size and fish size, but some difference did exist between age classes. Variations in egg number are therefore attributable to fish size, egg size and adequacy of diet. Starvation has also a lasting effect on the proportion of a given age-class which matures. (Auth.)

5347. Ross, A. J., and H. E. Johnson (U. S. Bur. Sport Fish. and Wildl., Seattle, Washington). 1962. STUDIES OF TRANSMISSION OF MYCOBACTERIAL INFECTIONS IN CHINOOK SALMON. Prog. Fish-Cult. 24(4): 147-149.

Investigations were conducted to examine the possibility of transmitting mycobacterial infection from parental sources to hatchery-reared chinook salmon Oncorhynchus tshawytscha, either by direct physical transfer to the eggs at the time of spawning or by transovarian passage. Progeny from a negative male x negative female, positive male x positive female, positive male x negative female, and negative male x positive female were observed over a 15-month period. Examinations included direct smear, cultural and histological procedures. No evidence of infection was noted. It was concluded that the processes studied are not likely to contribute significantly to the spread of the disease. (Authors)

5348. Weber, Douglas D., and George J. Ridgway (U. S. Bur. Comm. Fish., Seattle, Washington). 1962. THE DEPOSITION OF TETRACYCLINE DRUGS IN BONES AND SCALES OF FISH AND ITS POSSIBLE USE FOR MARKING. Prog. Fish-Cult. 24(4): 150-155.

Administration of antibiotics of the tetracycline series to several salmonid species resulted in fixation of a fluorescent material in proliferating bone tissue and scales. Tetracyclines were administered by either intraperitoneal injection, incorporation in the diet, or immersion of the fish in tetracycline solution. In every situation there was evidence of fluorophor deposition. Once the fluorophor is deposited, its presence is detectable for long periods of time. The possible use of this phenomenon as a means of marking fish is considered and discussed. (Authors)

5349. Needham, P. R., and Robert J. Behnke (University of California, Berkeley). 1962. THE ORIGIN OF HATCHERY RAINBOW TROUT. Prog. Fish-Cult. 24(4): 156-158.

The rainbow trout Salmo gairdneri originally used for the establishment of hatchery rainbow trout was from the McCloud River, California. The McCloud and other waters of the upper Sacramento River system had a fine-scaled resident trout and runs of anadromous steelhead. Evidence is presented to show that both of these types of trout were used to establish the original hatchery rainbow trout; thus, the "Shasta" rainbow trout of fish-cultural frame was actually a mixture of these two forms. (Authors)

5350. Hida, Thomas S., and Donald A. Thomson (U. S. Bur. Comm. Fish., Honolulu, Hawaii). 1962. INTRODUCTION OF THE THREADFIN SHAD TO HAWAII. Prog. Fish-Cult. 24(4): 159-163.

The Bureau of Commercial Fisheries Biological Laboratory, Honolulu, has been searching for a suitable supplementary bait fish, as the supply of the local anchovy has often been inadequate to meet the live-bait requirements of the Hawaiian skipjack fleet. The threadfin shad, Dorosoma petenense Gunther, was introduced to Hawaii in 1958 and 1959 because it had some characteristics desirable in a tuna bait fish and is a good forage species for fresh-water game fish. The shad has spawned in 3 reservoirs and has become well established within a year. There have been no indications of spawning in outdoor and indoor tanks, nor in 2 rivers into which it was introduced. Though the shad is extremely fragile and therefore difficult to harvest for live bait, it would hold some promise if a method of cultivation could be found in which seining and transporting operations were eliminated. (Authors)

5351. Surber, Eugene W., and Quentin H. Pickering (Public Health Service, Cincinnati, Ohio). 1962. ACUTE TOXICITY OF ENDOTHAL, DIQUAT, HYAMINE, DALAPON, AND SILVEX TO FISH. Prog. Fish-Cult. 24(4): 164-171.

Endothal was less toxic to fish than diquat, silvex, or Hyamine 1622. Tested with endothal,

bluegills had a 96-hr. TL_m of 180 and 160 ppm, respectively, in soft and hard water; largemouth bass fingerlings in soft water showed good tolerance (96-hr. TL_m of 200 ppm). Tested with diquat, bluegills had a 96-hr. TL_m of 72 ppm in soft water and 140 ppm in hard water. In soft water, fathead minnows were about 5 times more sensitive to diquat than bluegills; in hard water, fathead minnows were very tolerant to both endothal and diquat. Young bluegills had little or no safety margin for silvex in either soft or hard water, but fathead minnows showed good tolerance. Pelletized silvex was less toxic than silvex solution in both soft and hard water. Hyamine 1622 and Hyamine 2389 had high acute toxicities in soft water for both bluegills and fathead minnows; the toxicities were about half as great in hard water. The sodium salt of dalapon had low acute toxicity to fingerling bluegills and fathead minnows in soft and hard water. (Authors)

5352. Normandeau, Donald A. (New Hampshire Fish and Game Dept., Concord). 1962. MICRO-HEMATOCRIT VALUES FOR SOME SALMONIDS REARED IN NEW HAMPSHIRE. Prog. Fish-Cult. 24(4): 172-176.

Mean hematocrit values for brook trout (Salvelinus fontinalis), rainbow trout (Salmo gairdneri), lake trout (Salvelinus namaycush), splake trout, and landlocked salmon (Salmo salar) were determined for each of New Hampshire's 8 hatcheries and rearing stations. Significant variations were observed between stations, but these statistics were not found to be consistent. Temperature did not appear to be significant in causing changes in hematocrit values. A correlation between time and mean hematocrit values was obtained. There was a significant increase in the mean hematocrits of brook trout over a 3-month period. This increase is relatively small (0.71%), but should not be disregarded. (Auth.)

5353. Richard, James B. (California Dept. of Fish and Game, Sacramento). 1962. TESTS ON THERMOCLINE PENETRATION BY SEVERAL ROTENONE PRODUCTS. Prog. Fish-Cult. 24(4): 177-181.

In an effort to find a rotenone product better suited for aerial application, 2 specially prepared forms of rotenone--a pellet type and a flake type--were compared with some commonly used rotenone products. The comparisons were made under conditions simulating thermal stratification in lakes. A 21-ft. vertical tube, with a viewing box on the bottom and provisions for causing thermal stratification, was set up to test the effectiveness of the various rotenone products in killing fish below the thermocline. Three test fish, either carp or brown bullhead, were placed in individual cages and suspended at different temperature levels in each test. All products tested penetrated the thermocline and caused complete kills within 30 hrs. at a calculated rotenone concentration of 0.10 ppm. (Auth.)

5354. Post, George (Utah Department of Fish and Game, Logan). 1962. FURAZOLIDONE (NF-180) FOR CONTROL OF FURUNCULOSIS IN TROUT. Prog. Fish-Cult. 24(4): 182-184.

A dose level of 25 mg/kg (1.14 g/100 lb.) of fish per day for a minimum of 20 days is recommended. (Auth.)

5355. Meehan, William R., and L. Revet (Alaska Dept. of Fish and Game, Kodiak). 1962. THE EFFECT OF TRICAINE METHANESULFONATE (M. S. 222) AND/OR CHILLED WATER ON OXYGEN CONSUMPTION OF SOCKEYE SALMON FRY. Prog. Fish-Cult. 24(4): 185-187.

In an effort to determine what survival of sockeye salmon, Oncorhynchus nerka, fry could be expected under various conditions during transportation for stocking purposes, a series of laboratory experiments was conducted using an anesthetic (M. S. 222), chilled water, and combinations of the two. Two different densities of fry were tested under these conditions. Results were somewhat erratic; in general, however, it was shown that the use of either M. S. 222 or chilled water decreased oxygen consumption and resulted in higher survival, whereas a combination of M. S. 222 and chilled water caused rapid mortalities in fry. (Authors)

5356. Anderson, Gaylord A. (U. S. Bur. Comm. Fish., Marquette, Michigan). 1962. THREE PORTABLE FEEDERS FOR METERING CHEMICAL INTO STREAMS FOR CONTROL OF SEA LAMPREY. Prog. Fish-Cult. 24(4): 190-192.

A gravity feeder, a fuel-pump feeder, and an electric-pump feeder are described.

5357. Mairs, Donald F., and Theresa E. Kennedy (U. S. Bur. Sport Fish. and Wildl., La Crosse, Wisconsin). 1962. EVALUATION OF SOME HEPARINIZED CAPILLARIES FOR MICROHEMATOCRIT DETERMINATIONS OF WARM-WATER FISHES. Prog. Fish-Cult. 24(4): 188-189.

The hematocrit value, representing the percentage of packed red cells in blood, is useful in determining the condition of fish. Blood samples for this technique are collected in capillary tubes which have been treated with an anticoagulant, as clotting of the sample negates the value of the test. Capillaries treated for use in human hematology, obtained from a commercial source, were tested with 14 species of warm-water fish to determine whether the anticoagulant treatment was sufficient to prevent clotting. Clotting was variable in frequency, but so extensive that only 1 species (the bluegill) would be amenable to determinations with the capillaries used. (Authors)

5358. Sanders, Bob G., and James E. Wright (Pennsylvania State University, University Park, Penna.). 1962. IMMUNOGENETIC STUDIES IN TWO TROUT SPECIES OF THE GENUS SALMO. Annals of the New York Academy of Sciences, Vol. 97, Article 1, pp. 116-130.

Blood group systems in rainbow and in brown trout have been identified by the use of reagents prepared from rabbit antirainbow and antibrown

trout sera.

The system of three phenotypes in rainbow trout has been concluded to be under the control of a two-allele genetic system.

Differing populations of rainbow trout differ in frequencies of the three phenotypes.

Four phenotypes have been identified in mature brown trout; only two phenotypes have been identified among the fingerling progeny of these fish.

It has been suggested that red blood cells of certain individual brown trout change during the yearling stage through some mechanism rendering them inagglutinable by one of the two reagents. (Authors)

5359. Zimmer, Paul D., and Clifton C. Davidson (deceased), (Bur. of Comm. Fish. Columbia Fish. Program Office, U. S. Fish and Wildl. Service, Portland, Oregon). 1962. ANNUAL FISH PASSAGE REPORT - ROCK ISLAND DAM, COLUMBIA RIVER, WASHINGTON, 1960. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 419, 21 pp.

Important runs of salmon and steelhead trout pass Rock Island Dam on the Columbia River. Annual records of fish movement past the dam are available from 1933.

Count of 26,550 chinook salmon in 1960 is slightly more than half the peak year of 1957. Sockeye salmon count of 60,341 exceeded the 27-year mean of 52,823. Only 94 coho salmon were recorded. Greatest count of coho salmon, 229, occurred in 1947. Numbers of steelhead trout passing Rock Island Dam increased in 1960. The 27-year mean of 2,946 steelhead trout was less than the 1960 count of 6,226. Approximately 150,660 fish other than salmon and steelhead trout passed Rock Island Dam in 1960. (Authors)

5360. McNulty, J. Kneeland, Robert C. Work, and Hilary B. Moore (Institute of Marine Science, Univ. of Miami, Miami, Florida). 1962. LEVEL SEA BOTTOM COMMUNITIES IN BISCAYNE BAY AND NEIGHBORING AREAS. Bulletin of Marine Science of the Gulf and Caribbean, Vol. 12, No. 2, pp. 204-233.

Grab samples were taken at 180 stations in the neighborhood of Biscayne Bay, Florida. These were from level soft bottom, free from "grasses", and in shallow water. All species of infauna taken are recorded, together with their relative frequency in relation to the particle size of the sediment. The following communities are distinguished, and their significance discussed: Amphioplus-Ophionephthys, Laevicardium-Codakia, Mellita-Tellina, Encope, Amphioplus-Dosinia, Plagiobrisus-Clypeaster, Venus. (Authors)

5361. Bergeron, Julien (Station de Biologie marine, Grande-Rivière (Gaspé-sud), Quebec, Canada). 1962. BIBLIOGRAPHIE DU SAUMON DE L'ATLANTIQUE (SALMO SALAR L.). Contributions du Ministère de la Chasse et des Pêcheries, Québec - No. 88, 64 pp.

5362. Heron, J. (Freshwater Biological Association, Ambleside, England). 1962. DETERMINATION OF PHOSPHATE IN WATER AFTER STORAGE IN POLYETHYLENE. Limnology and Oceanography, Vol. 7, No. 3, pp. 316-321.

The changes in phosphate concentration which take place when lake water is stored in polyethylene bottles have been studied. The reduction in phosphate concentration which occurs is attributed to bacterial action and not to absorption of phosphate by collecting the sample in a polyethylene bottle which has been treated with a solution of iodine in potassium iodide solution. (Auth.)

5363. Smith, Stanford H. (U. S. Bur. of Comm. Fish., Ann Arbor, Michigan). 1962. TEMPERATURE CORRECTION IN CONDUCTIVITY MEASUREMENTS. Limnology and Oceanography, Vol. 7, No. 3, pp. 330-334.

Electrical conductivity has been widely used in freshwater research but usual methods employed by limnologists for converting measurements to conductance at a given temperature have not given uniformly accurate results. The temperature coefficient used to adjust conductivity of natural waters to a given temperature varies depending on the kinds and concentrations of electrolytes, the temperature at the time of measurement, and the temperature to which measurements are being adjusted. The temperature coefficient was found to differ for various lake and stream waters, and showed seasonal changes. High precision can be obtained only by determining temperature coefficients for each water studied. Mean temperature coefficients are given for various temperature ranges that may be used where less precision is required. (Auth.)

5364. McConnell, William J. (Arizona Cooperative Wildlife Research Unit, Univ. of Arizona, Tucson). 1962. PRODUCTIVITY RELATIONS IN CARBOY MICROCOSMS. Limnology and Oceanography, Vol. 7, No. 3, pp. 335-343.

Measurements of gross photosynthesis, respiration, rate of net oxygen diffusion, and organic storage are reported for 7 microcosms maintained over periods of 5 to 7 months. Average rates of gross photosynthesis ranged from 0.86 to 1.69 g O_2/m^2/day and were related to the amounts of inorganic nutrients added. Average final organic storage was equal to 35.6% of gross photosynthesis. Assumed photosynthetic quotients between 0.88 and 1.03 allowed the construction of oxygen budgets in which the total product of gross photosynthesis was accounted for. Some problems of establishing productive microcosms representing natural situations are also discussed. (Auth.)

5365. Parker, Richard A., and Donald H. Hazelwood (Washington State University, Pullman). 1962. SOME POSSIBLE EFFECTS OF TRACE ELEMENTS ON FRESH-WATER MICROCRUSTACEAN POPULATIONS. Limnology and Oceanography, Vol. 7, No. 3, pp. 344-347.

Among 10 trace elements considered, aluminum

was shown to be positively correlated and phosphorus negatively correlated with the density of Daphnia schødleri in Kepple Lake, Washington; chromium and vanadium were positively correlated and iron and strontium were negatively correlated with the density of Diaptomus leptopus. (Authors)

5366. Bamforth, Stuart S. (Department of Zoology, Tulane University, New Orleans, Louisiana). 1962. DIURNAL CHANGES IN SHALLOW AQUATIC HABITATS. Limnology and Oceanography, Vol. 7, No. 3, pp. 348-353.

Diurnal changes were studied at different times of the year in a variety of Louisiana ponds, swamps, ditches and streams by the following procedure. Collections were made between 0500 and 0600 and between 1500 and 1600 on one day, and at the same times several days later. Each sample was analyzed chemically and biologically. The times chosen measure the approximate high and low values of dissolved substances in the daily chemical cycle. The extent of change in chemical factors and plankton indicated the degree and role of oxidative processes in a shallow habitat, and provided a measure for comparing different habitats.

Plankton populations, predominantly protozoa, often changed during the day, and sometimes changed significantly within 2 hours after sunrise. The conditions and organisms found in shallow habitats may thus depend upon the time of sampling. (Auth.)

5367. Nelson, Daniel J. (Radiation Ecology Section, Health Physics Div., Oak Ridge Nat. Lab., Oak Ridge, Tennessee), and Donald C. Scott. 1962. ROLE OF DETRITUS IN THE PRODUCTIVITY OF A ROCK-OUTCROP COMMUNITY IN A PIEDMONT STREAM. Limnology and Oceanography, Vol. 7, No. 3, pp. 396-413.

A rock outcrop community in a typical southern Piedmont stream was studied to determine its trophic structure and productivity. Podostemum ceratophyllum was the primary producer component of the community and also provided a place of attachment and shelter for a rheophilic fauna consisting largely of insects. The primary consumer organisms derived 66% of their energy from allochthonous organic matter consisting largely of leaf material. Productivity by phytoplankton in the river water was insignificant as was respiration in the shifting sand bottom. The river behaved as a heterotrophic stream because of suspended organic detritus in the water. A higher and more variable quantity of particulate detritus was present in the water during summer than winter. This seasonal difference was attributed to stream discharge-stream bed relationships and a more rapid decomposition of organic fragments at higher summer temperatures.

The net annual productivities, determined by the cropping method in cal/cm^2 for trophic groups were: Podostemum 434, filter feeders 16.8, herbivores 6.51, detritus feeders 1.68, herbivore and detritus feeders 2.78 (total primary consumer 27.8), and carnivore 3.66. The turnover of biomass increased with increasing productivity by individual species but this relationship does not hold true for all communities. A comparison of trophic level production efficiencies and productivities in several communities suggests there are self-regulating mechanisms in natural communities which function between producer and consumer groups. Community stability is an important factor for the realization of maximum productivity in flowing water environments.

A theory of stream succession has been proposed which is based on the graded stream concept. (Authors)

5368. Klement, Alfred W., Jr., and Vincent Schultz (Div. of Biology and Medicine, AEC, Washington, D. C.). 1962. TERRESTRIAL AND FRESHWATER RADIOECOLOGY: A SELECTED BIBLIOGRAPHY. U. S. Atomic Energy Commission, TID-3910, 79 pp.

A list of 1,980 technical articles plus 50 bibliographies.

5369. Swain, A., W. G. Hartley (Freshwater Fish. Lab., Ministry of Agriculture, Fisheries and Food, Whitehall Place, London, S. W. 1, England), and R. B. Davies. 1962. LONG-DISTANCE MIGRATION OF SALMON. Nature, Vol. 195, No. 4846, p. 1122.

Recapture of a tagged salmon was made on October 19, 1961, near Kamgamiut (65° 50' N., 53° 21' W.), a small settlement north of Sukkertoppen and just outside the Arctic Circle. The fish was a male, 73 cm. overall and weighed 2.4 kgm. when gutted. It was tagged as a smolt approximately 20 cm. in length in the estuary of the River Usk, Monmouthshire, on April 27, 1960. The distance between tagging and recapture positions is about 2,000 miles.. (Authors)

5370. Verheijen, F. J. (Dept. of Fisheries, School of Natural Resources, University of Michigan, Ann Arbor). 1962. GAS SPITTING BY ALARMED FISH DISTURBS THEIR HYDROSTATIC EQUILIBRIUM. Science, Vol. 137, No. 3533, pp. 864-865.

The release of gas bubbles in alarm reactions is not the result of an ascending movement of the fish. Gas spitting initiates, or is at least closely connected to, a downward movement of the fish, and it purposefully disturbs the hydrostatic equilibrium of the fish instead of maintaining this situation. (Auth.)

5371. Hinton, Sam (Aquarium-Museum, Scripps Inst. of Oceanography, University of California, San Diego). 1962. LONGEVITY OF FISHES IN CAPTIVITY, AS OF SEPTEMBER, 1956. Zoologica, Vol. 47, Part 2, Nos. 8-10, pp. 105-116.

A list of the oldest known aquarium specimens.

5372. Piggins, D. J. (Farran Laboratory, Newport, Co. Mayo, Eire, Ireland). 1962. THYROID FEEDING OF SALMON PARR. Nature, Vol. 195, No. 4845, pp. 1017-1018.

In this small experiment there was an increase

of 80 percent in the production of 1+ smolts for an increase of not more than 25 percent in the feeding costs for the first year. However, had these 400 fish not become 1+ smolts, the cost of keeping them for a further full year would have been considerably more than the cost of thyroid material used in transforming them into 1+ smolts. The comparison in other districts may be even more favorable than in County Mayo, where the cost of thyroid material is high, relative to that of low-grade liver. Experimental work on lowered dosage-rates is planned for the coming season. (Auth.)

5373. Tal, Eliezer (Dept. of Zoology, The Hebrew Univ., Jerusalem). 1962. PRELIMINARY STUDY OF FLUCTUATIONS OF VITAMIN B_{12} CONTENT IN FISH PONDS IN THE BEITH-SHEAN VALLEY. Bamidgeh, Bulletin of Fish Culture in Israel, Vol. 14, No. 1, pp. 19-26.

B_{12} concentration was determined in samples taken from 2 ponds in Nir-David and 2 ponds in Mesilot during an 11-month period in 1959.

Differences in vitamin concentrations were found in different portions and depths of the same ponds, and from month to month.

Samples from the feeder channels mostly had B_{12} levels below the sensitivity of the assay. Since B_{12} excreting bacteria were isolated from the ponds, it is assumed that part of the B_{12} is produced in the ponds.

Results obtained from ponds were compared with published work on sea water. The relation of B_{12} concentration and the size of Prymnesium populations is discussed. (Auth.)

5374. Fessler, Floyd R. (Soil Conservation Ser., U. S. Dept. of Agri., Nashville, Tennessee), and Taylor A. Oncale. 1962. WATER QUALITY AFFECTS FISH PRODUCTION. Journal of Soil and Water Conservation, Vol. 17, No. 4, pp. 157-162.

Largemouth bass and bluegill are the fish generally managed for warm-water ponds. They do best when water temperatures are 55° F. and above. The oxygen content of the water should be no less than 0.3 ppm; a level of 1.0 ppm and above is preferred.

Rainbow trout are suited to cold-water ponds. They need at least 5 ppm of dissolved oxygen in the water, and the water temperature should seldom exceed 70° F.

Some factors that affect water temperature in an impoundment are solar heat, source of water supply, and routing of the waterflow through the pond.

Some factors that affect dissolved oxygen content in an impoundment are oxidation of organic matter, physical disturbances, photosynthesis, and thermal stratification.

Water temperature and dissolved oxygen in ponds and reservoirs can be influenced by the type of spillway installed.

Submersed-inlet spillways on impoundments on trout (and smallmouth bass) streams minimize changes in stream characteristics in and below the impoundment.

Submersed-inlet spillways on warm-water reservoirs supplied with flowing water improve the conditions for warm-water fish management by permitting the development of higher water temperatures in early spring, by allowing early efficient fertilization, and by removing oxygen-depleted water.

Artificial circulation of impounded water is one way to oxygenate the lower strata of water in ponds that do not overflow continuously and that are supplied only by runoff. (Authors)

5375. Aldrich, David V. (Bur. of Commercial Fish., Biol. Lab., Galveston, Texas). 1962. PHOTOAUTOTROPHY IN GYMNODINIUM BREVE DAVIS. Science, Vol. 137, No. 3534, pp. 988-990.

Pure cultures of the Florida "red-tide" flagellate required light and carbon dioxide for growth. Multiplication in darkness was not supported by any of a number of organic compounds and mixtures. The ecological importance of micronutrients is suggested. (Auth.)

5376. Ehrlich, Paul R., and Richard W. Holm (Dept. of Biol. Sciences, Stanford University, Stanford, California). 1962. PATTERNS AND POPULATIONS. Science, Vol. 137, No. 3531, pp. 652-657.

In broad investigations of the patterns of interaction and relationship among organisms the artificial and stultifying fragmentation of population biology into divisions such as taxonomy, population genetics, and ecology should be ignored. Care also should be taken to scrutinize current concepts such as "species", "niche", and "community". If some emergent patterns seem to correspond to a great degree with these concepts, then the concepts may be given operational definitions and the labels should be retained. If there is no such correspondence, then the concepts will have outlived their usefulness and should be discarded.

The basic units of population biology are not communities, species, or even populations, but individual organisms. In populations, variation, growth, genetic equilibria, selection, behavior, and so on are not "things" but relationships. Therefore, what is of interest in population biology is the pattern in which organisms are related in space and time. (Authors)

5377. Kashiwada, Ken-ichi, and Daiichi Kakimoto (Fac. Fish. Kagoshima Univ., Kagoshima, Japan). 1962. STUDIES ON VITAMIN B_{12} IN NATURAL WATER. VII. RELATION BETWEEN THE FERTILITY AND THE VITAMIN B_{12} CONTENT OF LAKES. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 28, No. 3, pp. 352-360.

Lakes and marshes can be classified according to their content of nutritive salts into eutrophic, mesotrophic and oligotrophic ones. In order to find how the trophic level or fertility of these waters is connected with vitamin B_{12} content, the authors measured the latter, selecting 10 lakes and marshes in Japan. The level of vitamin B_{12} found for typical

eutrophic lakes, and that estimated for typical oligotrophic lakes, is in striking contrast to each other, while that for a typical mesotrophic lake was between the two.

It may be concluded that in the trophic type of lakes and marshes there exists a relation between the content of nutritive salts and vitamin B_{12}. (Authors)

5378. Tomiyama, Tetuo, and Katsumi Kawabe (Lab. Fish. Chem., Fac. Agr., Kyushu Univ., Fukuoka, Japan). 1962. THE TOXIC EFFECT OF PENTACHLOROPHENATE, A HERBICIDE, ON FISHERY ORGANISMS IN COASTAL WATERS. I. THE EFFECT ON CERTAIN FISHES AND A SHRIMP. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 28, No. 3, pp. 379-382.

It has been reported that the 24-hr. TLm's of sodium pentachlorophenate (PCP) for fresh water fishes ranged from 0.07 to 0.6 ppm. No report has been made so far of its toxic effect on marine organisms. The study was undertaken to answer a question whether or not PCP is toxic to organisms in coastal waters.

Under a condition of keeping one test organism in 1 to 2 liters of the solution under test at 29° C and of daily renewal of the test solution, the 24-hour and 48-hour TLm's of PCP were found to be 0.09 and 0.08 for "guchi", Nibea albiflora, 0.40 and 0.25 ppm for "warasubo", Odontamblyopus rubicundus, and 3.4 and 2.3 ppm for "shiraebi", Leander japonicus, respectively, and the 24-hour TLm to be 0.20 ppm for eel, Anguilla japonica. The avoidance reactions of "guchi" to PCP in a gradient tank showed that the fish could discriminate PCP at level of 0.2 to 0.3 ppm. (Authors)

5379. Prakash, A. (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, B. C.). 1962. SEASONAL CHANGES IN FEEDING OF COHO AND CHINOOK (SPRING) SALMON IN SOUTHERN BRITISH COLUMBIA WATERS. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 5, pp. 851-866.

Food study based on the stomach analyses of 551 chinook salmon, Oncorhynchus tshawytscha, and 659 coho salmon, O. kisutch, collected from the various localities along the southern British Columbia coast during the summer of 1957 revealed that herring followed by crustaceans formed the most important items of the diet of the two species. Coho salmon exhibited a more pelagic and varied diet than chinook salmon caught in the same area. Definite seasonal fluctuations in the composition of food and feeding intensity were noticed. Considerable amounts of Crustacea were taken in early summer months and after that fish assumed importance.

Qualitative and quantitative differences in the feeding of these two species on the east and west coasts of Vancouver Island appear to warrant the establishment of two food type areas. Although herring constitute the major food item of both spring and coho salmon, evidences are presented in support of the hypothesis that a change in herring stock is not likely to affect salmon abundance in British Columbia coastal waters. (Auth.)

5380. Gilmartin, Malvern (Inst. of Oceanography, Univ. of British Columbia, Vancouver, B. C.). 1962. ANNUAL CYCLIC CHANGES IN THE PHYSICAL OCEANOGRAPHY OF A BRITISH COLUMBIA FJORD. Journal of the Fisheries Research Board of Canada, Vol. 19, No. 5, pp. 921-974.

Indian Arm (49° 30' N, 122° 53' W), one of the characteristic fjords of the coast of British Columbia, was intensively studied during 35 approximately monthly cruises during 1956 through 1959, with the main objective of determining the annual cycle of its oceanographic features. Unique in its duration of a British Columbia fjord study, this observational time series of the distributional patterns of salinity, temperature, density, dissolved oxygen and climate is presented, and used to analyze the circulation pattern and replenishment mechanism of fjord waters. (Auth.)

5381. Crossman, E. J. (Dept. of Ichthyology and Herpetology, Royal Ontario Museum, Univ. of Toronto, Toronto, Ontario, Canada). 1962. PREDATOR-PREY RELATIONSHIPS IN PIKES (ESOCIDAE). Journal of the Fisheries Research Board of Canada, Vol. 19, No. 5, pp. 979-980.

In two pairs of closely related esocid fishes living in similar habitats, one pair seems to display a high degree of association and the other pair almost none at all, while other members of the family show a prey selection based principally or solely on relative abundance. (Auth.)

5382. Steffens, W., U. Lieder, D. Nehring, and H. W. Hattop. 1962. ADVANTAGES AND DANGERS OF THE USE OF MALACHITE GREEN IN FISH CULTURE. (MOGLICHKEITEN UND GEFAHREN DER ANWENDUNG VON MALACHITGRUN IN DER FISCHEREI.) Zeitschr. f. Fischerei, etc. 10 (N. F.): 745-771.

Malachite green is very effective for control of superficial fungal and protozoan infections of fish and fish eggs. Due to its toxic effect, it should be handled with utmost care because it may cause delayed damage to humans and fish. Since food fishes are seldom treated with malachite green and little, if any, can be stored in fish tissues, eating of fish occasionally treated with it is entirely safe. However, the practice of dying some algae (Laminarias which are used for human food in Asiatic countries) must be considered unsafe. (S. F. S.)

5383. Dees, L. T. (Div. of Resource Development, U. S. Dept. of the Interior, Washington, D. C.). 1962. A LIST OF THE FISHERY BULLETINS OF THE U. S. FISH AND WILDLIFE SERVICE. U. S. Fish and Wildlife Service, Fishery Leaflet 537, 16 pp.

5384. Dees, L. T. (Div. of Resource Development, U. S. Dept. of the Interior, Washington, D. C.).

1962. LIST OF FISHERY LEAFLETS OF THE U. S. FISH AND WILDLIFE SERVICE. U. S. Fish and Wildlife Service, Fishery Leaflet 540, 37 pp.

5385. Mount, Donald Irvin (Ohio State University, Columbus, Ohio). 1962. CHRONIC EFFECTS OF ENDRIN ON BLUNTNOSE MINNOWS AND GUPPIES. U. S. Fish and Wildlife Service, Research Report 58, 38 pp.

In an investigation of chronic toxicity of endrin to bluntnose minnows and guppies, conducted for 291 days, neither species could withstand concentrations greater than 0.5 parts per billion of endrin in water for more than a few days. Less than 50 percent of the test animals could live in 0.5 p. p. b. for more than 30 days. Approximately 65 percent could live in 0.4 p. p. b. for periods exceeding 30 days, while there was little mortality due to endrin in 0.25 and 0.1 p. p. b. endrin in water.

Fish suffering from endrin poisoning exhibited symptoms (increased ventilation rate, convulsions, and loss of equilibrium) which indicate that it affects the central nervous system. Sublethal concentration caused increased activity and hypersensitivity to stimuli. No cell damage was found in fish which were able to survive in endrin concentrations, and essentially no physical effects other than increased activity were noted. Adult female guppies ceased to have young when placed in endrin concentrations, but the gonads of the bluntnose minnows were approaching sexual maturity when the test was terminated.

Endrin had no effect on oxygen consumption in the seven bluntnose minnows tested. Neither did acute exposure to endrin significantly affect the ability of the fish to swim against a current of water.

Endrin does not appear to be cumulative in its effects on guppies and on bluntnose minnows. Little or no tissue damage was found in fish which could live in water containing endrin, and fish seemed to recover completely from one exposure to endrin. The increased activity caused by very low concentrations of endrin could be very damaging to fishes in natural waters, disrupting spawning and subjecting the fish to predation and other decimating factors. (Auth.)

5386. Bulkley, Ross V., and Norman G. Benson (Rocky Mountain Sport Fishery Investigations, Logan, Utah). 1962. PREDICTING YEAR-CLASS ABUNDANCE OF YELLOWSTONE LAKE CUTTHROAT TROUT. U. S. Fish and Wildlife Service, Research Report 59, 21 pp.

Fluctuations in strength of year classes from 1945 to 1956 of Yellowstone Lake cutthroat from Pelican and Chipmunk Creeks are compared with the parental stock and several climatically influenced factors in the environment. Variations in year-class strength in the two tributaries were highly correlated with fluctuations in lake water levels. Strong year classes occurred in years of low water. Female spawner escapement, timing of the runs, and summer air temperatures were not significant factors.

A formula based on water levels is presented for predicting year-class strength in Pelican Creek and in the Fishing Bridge area fishery.

Stocking of fry in years of high water is suggested as a means of supplementing natural production. A method of forecasting lake water levels several months in advance of their occurrence is discussed. (Authors)

5387. Otsu, Tamio, and Richard J. Hansen (Bur. of Comm. Fish., Biol. Lab., Honolulu, Hawaii). 1962. SEXUAL MATURITY AND SPAWNING OF ALBACORE IN THE CENTRAL SOUTH PACIFIC OCEAN. U. S. Fish and Wildlife Service, Fishery Bulletin 204, Vol. 62, 11 pp.

Developmental stages of gonads of the albacore, Thunnus germo (Lacepede), taken in the central South Pacific Ocean by Japanese and South Korean longline vessels based in American Samoa were studied. The samples comprised 782 pairs of ovaries and 990 pairs of testes collected between August 1957 and September 1958 from 256 landings.

Occurrence of ova in late stages of development indicates that the South Pacific albacore spawn during the southern summer months, between September and March, as opposed to the northern summer spawning of the North Pacific albacore. This difference in spawning periods is believed to constitute evidence that the stocks of albacore in the South Pacific and the North Pacific are independent of each other. The data suggest that the bulk of the spawning activity of South Pacific albacore is confined to the area between the Equator and 20° S latitude. No east-west differences in occurrence of developing ovaries were discernible. (Authors)

5388. Smith, C. Lavett, and Reeve M. Bailey (Mus. of Zool., Univ. of Michigan, Ann Arbor). 1962. THE SUBOCULAR SHELF OF FISHES. Journal of Morphology, Vol. 110, No. 1, pp. 1-18.

The subocular shelf is interpreted as a mechanism for stiffening the suborbital ring. It apparently developed first in the Beryciformes with bones two through five of the suborbital series contributing to the shelf. Through selective modification and loss of elements the shelf has assumed diverse form in various groups of perciform fishes. Structural change of the shelf and associated parts has proceeded in several directions - additional bracing through contact with the skull or the palatoquadrate arch, reduction or complete loss, and utilization as a muscle origin. Complete loss of the shelf has occurred in several freshwater families, in midwater and pelagic fishes, and in fishes with specialized mouthparts for which additional flexibility is required. Loss of the suborbitals or failure of ossification is a frequent specialization in perciforms and their derivatives.

The subocular shelf is usually a consistent taxonomic character at the family level, but in a few families some forms have and others lack the shelf. Those known to us are the Carangidae, Empheridae, Scorpaenidae, and Sparidae. Modifications in the shape or structural composition of the

shelf may prove useful either at infrafamily or suprafamily levels. There is indication that changes in the form of the shelf take place slowly and that the shelf may serve as an indicator of phyletic history. (Authors)

5389. Edwards, Robert L., Robert Livingston, Jr. (Bur. of Comm. Fish. Biol. Lab., Woods Hole, Massachusetts), and Paul E. Hamer. 1962. WINTER WATER TEMPERATURES AND AN ANNOTATED LIST OF FISHES--NANTUCKET SHOALS TO CAPE HATTERAS, ALBATROSS III CRUISE NO. 126. U. S. Fish and Wildlife Service, Special Scientific Report-Fisheries No. 397, 31 pp.

5390. Howell, John H. (Bur. of Comm. Fish., Millersburg, Michigan), and Willman M. Marquette. 1962. USE OF MOBILE BIOASSAY EQUIPMENT IN THE CHEMICAL CONTROL OF SEA LAMPREY. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 418, 9 pp.

The use of 3-trifluormethyl-4-nitrophenol as a selective toxicant to destroy sea lamprey larvae in streams tributary to the Great Lakes requires that a bioassay be conducted before each application. The wide geographic distribution of the streams requires further that the equipment to conduct the bioassays be mobile. The necessary facilities were installed in an 18-foot housetrailer shell. This equipment is described and the methods for its use are outlined. Selected data from bioassays in water from streams tributary to the U. S. shore of Lake Superior are presented and the significance of these data explained. (Authors)

5391. Hunt, Robert L., Oscar M. Brynildson, and James T. McFadden (Wisconsin Cons. Dept., Madison, Wisconsin). 1962. EFFECTS OF ANGLING REGULATIONS ON A WILD BROOK TROUT FISHERY. Wisconsin Conservation Department, Technical Bulletin No. 26, 58 pp.

The effects of different angling regulations on a wild brook trout population and fishery were studied at Lawrence Creek, which contains a dense population of this species and has a reputation for "good trout fishing".

During six years of continuous research, three sets of regulations were evaluated: a 6-inch minimum size limit and bag limit of 10 (1955 season), no size limit and no bag limit (1956-57 seasons), and a 9-inch minimum size limit and bag limit of 5 (1958-60 seasons).

Regardless of the bag limit or size limit in effect, the amount of angling mortality which occurred during the 1955-60 seasons was found to be a function of the relationship existing between angling intensity and density of trout. Angling mortality is an inverse density-dependent factor. If angling pressure remains constant, the rate of exploitation increases as the density of trout decreases. Or, any increase in angling pressure brings about a proportionately greater depletion of sparse trout populations than of dense trout populations. (Authors)

5392. Harvey, Harold H. (14745 109 A Avenue, North Surrey, British Columbia, Canada), and A. C. Cooper. 1962. ORIGIN AND TREATMENT OF A SUPERSATURATED RIVER WATER. International Pacific Salmon Fisheries Commission, Progress Report No. 9, 19 pp.

A case of river water supersaturation is described and discussed in relation to the pertinent literature.

A distinction is made between physical (abiogenic) and biological (biogenic) oxygen supersaturation of natural waters. The former, being accompanied by nitrogen supersaturation, rapidly induces gas bubble disease in fish, whereas the latter has deleterious effects on fish only at very high oxygen tensions.

In certain instances there may be little doubt as to whether supersaturation results from photosynthesis or through falls and rapids. However, in doubtful cases, diagnosis of stream supersaturation by means of dissolved oxygen determinations must be accompanied by dissolved nitrogen analysis or oxygen sampling must extend over the period of maximum and minimum photosynthetic activity.

Two methods of treatment of supersaturated water are evaluated. A highly effective air-equilibrating tower is described.

The injuries and mortalities appearing among sockeye alevins and fry which were exposed to high (120 percent of air saturation) and low (106 percent) levels of supersaturated water are reported. (Authors)

5393. Elkins, Winston A., and Robert W. Sharp (Bur. of Sport Fish. and Wildl., Minneapolis, Minnesota). 1962. RECREATIONAL FISHING IN THE NATIONAL WILDLIFE REFUGES. U. S. Fish and Wildlife Service, Circular 152, 36 pp.

The 279 National wildlife refuges provided approximately 3 1/2 million fisherman-days of angling in 1960. Distributed over the four flyways, and extending from Alaska to the Florida Keys, the refuges provide a wide variety of fishing. Almost all of the North American game and panfish, from king salmon to bluegill, are found in waters of the refuge system.

Fishery management practices are carried out as far as primary objectives of refuges will permit. Some management measures are beneficial both to waterfowl and fish. Public use of the refuges creates problems commonly associated with largescale recreational activities. Parking, picnic and sanitary facilities must be provided, usually by stretching operational funds badly needed for other purposes.

Zoning of fishing, in time and space, has been useful in minimizing conflict with waterfowl production and protection. (Authors)

5394. U. S. Dept. of the Interior (Bur. of Sport Fish. and Wildl., Washington, D. C.). 1962. EFFECTS OF PESTICIDES ON FISH AND WILDLIFE IN 1960. U. S. Fish and Wildlife Service, Circular 143, 52 pp.

This report summarizes research findings for

1960, and also some earlier work of the Bureau of Commercial Fisheries. Reports published by Service personnel in 1960 are reviewed, and progress is reported for research studies underway. Certain publications appearing in 1960 that were prepared by other scientists are reviewed also. Separate accounts summarize the studies of the Branch of Fisheries Research and the Branch of Wildlife Research, both in the Bureau of Sport Fisheries and Wildlife, and the Branch of Shellfisheries of the Division of Biological Research in the Bureau of Commercial Fisheries. Recommendations are made for the use of pesticides that will cause minimum damage to wildlife; and additional research needs are outlined. (From Forword)

5395. Dmitrieva, E. N. 1960. SOME DATA ON THE DEVELOPMENT OF PIKE-PERCH OF RYBINSK RESERVOIR. (NEKOTORYE DANNYE O RAZVITII SUDAKA RYBINSKOGO VODOKHRANILISHCHA.) Trudy Inst. Morfol. Zhivotnykh Akad. Nauk SSSR 28. 107-128; Referat. Zhur., Biol., 1961, No. 2D342; Biological Abstracts, Vol. 39, No. 4, Abst. No. 13255. 1962.

The author investigated the development of native Stizostedion lucioperca in the Mologa-Sheksna interfluve, southeastern part of the Rybinsk reservoir, by the morpho-ecological method. The larval stages and first stages of fingerling development are described. The characteristics of the diet of the young are given. The development of the pike-perch of the Rybinsk reservoir is compared with the development of the semi-migratory pike-perch of the Don and Kuban. The linear limits and morphologic characteristics of the developmental stages studied approximate those in the species with which they are compared. The only major difference is the different type of diet in developmental stage F (body length approximately 20-37 mm). The food of the young of the semi-migratory pike-perch is young fish, chiefly carp; the food of the young Rybinsk reservoir pike-perch consists of plankton organisms. This is probably due to the different area inhabited by young carp and young pike-perch: the former remain in the coastal zone, the latter in the open part of the reservoir.

5396. Karzinkin, G. S. 1961. K. M. BER AND THE PROBLEM OF BIOLOGICAL PRODUCTIVITY OF BODIES OF WATER. (K. M. BER I PROBLEMA BIOLOGICHESKOI PRODUKTIVNOSTI VODOEMOV.) Vopr. Ikhtiol. 1(3): 377-382; Referat. Zhur., Biol., 1962, No. 1A38; Biological Abstracts, Vol. 39, No. 4, Abst. No. 13271. 1962.

In investigating the condition of fishing in Russia, K. M. Ber considered various questions relating to the biological productivity of a body of water. The process of producing a fish resource includes the process of constructing a nutritional base for the fish. In the opinion of Ber the number of fish is determined by the presence of nutrients. He indicated not only the variable character of feeding of adult fish at different seasons, but also at various periods of growth. In explaining the sources of the development of food supplies in reservoirs, Ber underestimated the significance of the production of organic substances in them. The development of food organisms, in his opinion, depends on microscopic plankton and other algae, and on organic substances introduced into reservoirs and decomposing in them. He considered the fecundity of fish an adaptation to maintaining their numbers at an unusual level. Mortality depends not only on predators, but also on physico-chemical conditions. Some species limit the numbers of others. An undesirable fish may displace a more valuable one. Ber did not give a conclusive presentation of the biological productivity of bodies of water.

5397. Savvaitova, K. A., and Yu. S. Reshetnikov. 1961. THE DIET OF VARIOUS BIOLOGICAL FORMS OF DOLLY VARDEN CHAR--SALVELINUS MALMA (WALB.) IN SOME BODIES OF WATER OF KAMCHATKA. (PITANIE RAZLICHNYKH BIOLOGICHESKIKH FORM GOL'TSA--SALVELINUS MALMA (WALB.) V NEKOTORYKH VODOEMAKH KAMCHATKI.) Voprosy Ikhtiol. 1(1): 127-135; Referat. Zhur., Biol., 1961, No. 21D360; Biological Abstracts, Vol. 39, No. 4, Abst. No. 13295. 1962.

The migratory, lake-river, and lake forms of Salvelinus malma are distinguished by the character of their diets. Migratory char live mainly on flying insects and insect larvae in the water; the lake-river char live on mollusks, insect larvae, and fish eggs; the lake char are predacious. The character of the diet of one biological form of S. malma depends on the habitat, season, and size of the fish. S. malma is not considered a harmful fish. In the regions investigated it consumes sticklebacks and smelts--food competitors of the sockeye salmon--and does more good than harm. Eating the eggs of the salmon, it fulfills the role of a cleaning agent in the spawning grounds, destroying eggs that are washed out by the current at the spawning ground or dislocated by other salmon that disturb the nests. At spawning time the lake char actually does not eat. The young and the dwarf males of S. malma eat flying insects and insect larvae in the water. The diet of various forms reflects the remarkable variability of this species. Various biological forms have a specific dietary character which permits them to occupy different nutritional niches.

5398. Van Someren, Vernon D. (East Africa Freshwater Fish. Res. Organ., Jinja). 1962. THE CULTURE OF TILAPIA NIGRA (GUNTHER) IN PONDS. VIII. THE EFFECT OF CROPPING A BREEDING POPULATION BY TRAPPING. E. African Agric. and Forest. and Jour. 176-185; Biological Abstracts, Vol. 39, No. 4, Abst. No. 13305. 1962.

In a 4-acre dam stocked for several years with a mixed breeding population of T. nigra, the operation of 2 traps of different design led to a daily decline of the exploitable fish at the rate of 1/6th by numbers per day. Within only eight days, practically all the larger fish of edible size had been removed, and there was a marked decrease in the

length frequency classes subsequently recorded. For a period of 24 days the dam yielded a crop of 90.1 lb. per acre, the proportion of males in the catch increasing as the catch declined. Eleven months later no fish larger than 15 cm were recorded, the trapping having presumably led to a greater survival of the unexploitable fingerlings and a consequent density-dependent suppression of their growth rate; the total biomass probably remaining constant within the limits of the pond productivity. Therefore, in order to obtain successive crops of large fish, it is essential to remove fingerlings at a high rate also, from any breeding culture. Trapping is more effective when wind is least, and catches are low at periods of high wind. (Auth.)

5399. Suckling, E. E. (State Univ. New York, Brooklyn). 1962. LATERAL LINE IN FISH. POSSIBLE MODE OF ACTION. Jour. Acoustical Soc. Amer. 34(1): 127-128; Biological Abstracts, Vol. 39, No. 4, Abst. No. 14442. 1962.

The proposal is made that fish detect low-frequency sounds as "internal vibrations" rather than as direct oscillations of the water. (Auth.)

5400. Potapov, A. A. 1960. CONTROL OF HIGHER WATER PLANTS IN RESERVOIRS BY MOWING AND HERBICIDES. (BOR'BA S VYSSHEI VODNOI RASTITEL' NOST'YU NA VODOKHRANILISHCHAKH METODAMI VYKASHIVANIYA I S POMOSHCH'YU GERBITSIDOV.) Byull. Inst. Biol. Vodokhranilishch Akad. Nauk SSSR 8/9. 14-16; Referat. Zhur., Biol., 1961, No. 24G755; Biological Abstracts, Vol. 39, No. 4, Abst. No. 16447. 1962.

Salts of 2, 4-D (5 kg/ha) should be used in the control of Alisma sp., Sagittaria sp., and Sparganium sp.; esters of 2,4-D (10-15 kg/ha) should be used against Typha latifolia, Carex sp. and Scirpus sp.; ammonium sulfammate (300-600 kg/ha) should be used against Glyceria maxima. Phragmites sp. and T. latifolia are easily eliminated by mowing 3-4 times during the season.

5401. Dahl, Erik (Zool. Inst., Lund, Sweden). 1961. THE ASSOCIATION BETWEEN YOUNG WHITING, GADUS MERLANGUS, AND THE JELLY-FISH, CYANEA CAPILLATA. Sarsia 3. 47-55; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17636. 1962.

Young whiting probably profit from the protection offered by jelly-fish. They feed upon plankton organisms, mainly copepods, and do not normally attack the jelly-fish although in the aquarium they may take minced jelly-fish tissue. They take Hyperia galba when offered. They appear to have obtained a certain degree of immunity from the nematocysts of Cyanea. This is probably due to the properties of their body surface, for contact with tentacles does not produce large-scale discharge of nematocysts. (Auth.)

5402. Berczik, A. (Eötvös Univ., Budapest, Hungary). 1961. SOME OBSERVATIONS RELATIVE TO THE HORIZONTAL DISTRIBUTION OF THE MACRO-BENTHOS OF SHALLOW "PANNONIC" LAKES. (EINIGE BEOBACHTUNGEN BEZÜGLICH DER HORIZONTALEN VERTEILUNG DES MAKRO-BENTHOS SEICHTER "PANNONISCHER" SEEN.) Acta Zool. Acad. Sci. Hungaricae 7(1/2): 49-72; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17682. 1962.

Between 1952 and 1955 at the Valenceer Lake and at the Ores Lake in Tata samples were obtained from various points of the bottom, strained and the part remaining investigated. Such data as the O_2 content and pH value were recorded and are presented in various tables. The geography and other properties of the two lakes were detailed, especially in regard to the leading species, Chironomus plumosus, which dominated to the extent of 92.4 in the Valenceer Lake and 79.0 in the other. Also common to the 2 lakes is the small number of species. They are also similar in that at varying sampling times the abundance at the various collecting stations changed little, and in the various species of Chironomus present. Finally in both lakes one finds that the larva count decreases with an increase in the amount of H_2S present, as it does with the accumulation of plant detrition or an increase in the number of snails present. The abundances of the various species of the macro-fauna are related to the nature of the sediment. It is claimed that the findings here prove that the production of macro-fauna in shallow lakes can vary quantitatively and qualitatively in regions covered with different sediments, and that these variations are spatially and temporally relatively constant. (H. M. B.)

5403. Chalupa, Jiří, and Miroslav Štěpánek (Inst. Chem. Technol., Prague, Czechoslovakia). 1957. A CONTRIBUTION TO THE STUDY OF VERTICAL MIGRATION OF ZOOPLANKTON AND ENVIRONMENT CHARACTERISTICS IN RESERVOIR SEDLICE (CZECHOSLOVAKIA). (PRISPEVEK KE STUDIU VERTIKALNI MIGRACE ZOOPLANKTONU A CHARAKTERISTICE PROSTREDI V UDOLNI NADRZI SEDLICE.) Sbornik Vysoke Skoly Chem.-Technol. v Praze 1957: 249-337; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17685. 1962.

A 48-hour investigation in 2 hour intervals has been made on 11 m depth of the reservoir Sedlice to observe and estimate types of zooplankton vertical migration and acting of meteorological, physical, and chemical conditions both alone and in relation with migration movement. On the basis of 276 samples collected, 12 forms of plankters (4 Rotatoria, 5 Cladocera, and 3 Copepoda) and some meteorological, physical, and chemical conditions have been observed. Meteorological data were taken from a 11. order station situated near the sampling station. All obtained numerical material was tabulated or graphed. Migration movements of individual forms of plankters expressed in Pennak quartile graphs. Some physical and chemical data interpreted in suitable manner using square, isocurves, and quartile graphs. Marked general or regular migration of 2 forms of plankters was noted (Acanthocyclops

americanus, adult stadia, Daphnia cucullata, young stadia). Other forms were characterized by partial (regular or irregular) migration. No migration movement was observed by the nauplii stadia. Influence of some outer factors on the migration movement was again noted (illumination, thermocline, age) for several plankters, and the classification of vertical migration movements of plankton proposed with special regard to conditions on reservoirs. A new method of investigating vertical migration of organisms in reservoirs was suggested, based on 3 vertical collecting stations. This eliminates the errors due to horizontal movements of water and individual populations of the same form. In the discussion, a comparison of results with facts estimated in articles dealing with vertical migration was made and it has been noted that investigation of this form was performed only on seas and lakes, not on reservoirs. The majority of formerly estimated facts has been confirmed. Some results have differed, e. g. the vertical distribution of nauplius stadia. It has been estimated that in the summer of 1955, 75% of all zooplankton organisms was concentrated in the 4 m stratum near the surface of the reservoir Sedlice. (Authors)

5404. Ehrlich, S., and K. Jedynak. 1962. NUTRIA INFLUENCE ON A BOG LAKE IN NORTHERN POMORZE, POLAND. Hydrobiologia 19(3): 273-297; Biological Abstracts, Vol. 39, No. 4, Abst. No. 17690. 1962.

Before the introduction of Myocastor coypu, the lake was only some 70 cm deep with 2-3 ha open water surface. In the summer of 1956, 200 subadult nutria were introduced. In 1958 and 1959 the population was kept at 1100 (about 11 nutria/ha). By 1959 the open area of the lake had been increased by the activities of the nutria to 11 ha and its maximum depth to 1 m. The effects of the nutria on the vegetation are described in detail. (K. E. M.)

5405. Hansen, Kaj. 1962. THE DYSTROPHIC LAKE TYPE. Hydrobiologia 19(2): 183-191; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17696. 1962.

From a review of the literature dealing with lakes of this type it is concluded that they differ from lakes with colorless water in that they contain acid humus in the water as well as in the sediments. These sediments are dy or tyrfopel not gyttja. Other differences are also noted. (K. E. M.)

5406. Hoak, R. D. (Mellon Inst., Pittsburgh, Pa.). 1961. THE THERMAL POLLUTION PROBLEM. Jour. Water Pollution Control Fed. 33(12): 1267-1276; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17698. 1962.

Proposals for control of thermal discharge in Pennsylvania are discussed from the standpoint of relative value of water for recreational fishing, environmental requirements of fish, influence of stream temperature on dissolved oxygen content and diurnal fluctuation in dissolved oxygen. Results of cooperative surveys of stream temperature are presented for the Allegheny, Monongahela, and Ohio Rivers in western Pennsylvania. Sanitary Water Board is quoted, calling for maintenance of stream temperature below 93° F except for trout streams where 58° F is specified, and permitting adjustment of these limits where local circumstances warrant. (I. G.)

5407. Lewis, William M., and Robert C. Summerfelt (Southern Illinois Univ., Carbondale). 1961. ADJUSTMENT OF ALKALINE RESERVE OF LAKES BY THE ADDITION OF HYDRATED AGRICULTURAL LIME. Trans. Illinois State Acad. Sci. 54(3/4): 168-174; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17702. 1962.

A lake in southern Illinois and minnow hatchery ponds supplied by a deep well and located in western Kentucky were found to be so poorly buffered as to permit the development of conditions lethal to fishes. In the lake situation, the results of poor buffering (total alkalinity 15 ppm) permitted the development of a high concentration of hydrogen ions. The lack of buffering in the hatchery ponds along with a high free carbon dioxide content (up to 45 ppm) and heavy algal bloom produced extreme fluctuations in hydrogen ion concentration, resulting in pH values of 4.5 to 5.0 at night, and 9.0 to 9.5 during midday. In the lake study, application of hydrated lime raised the buffering action of the water to a satisfactory level; alkalinity going from a low of less than 10 ppm to 56 ppm. Under the conditions of a constant inflow of water with a high carbon dioxide content, agricultural lime proved satisfactory for adjustment of the buffering ability of the hatchery ponds. Fluctuating hydrogen ion concentration resulting from poorly buffered water upon the golden shiner (Notemigonus crysoleucas) were observed to cause heavy mortality. Laboratory experiments were conducted under conditions simulating these occurring in the hatchery ponds. Mortality was found to be inversely correlated with total alkalinity in the presence of carbon dioxide. (Authors)

5408. Sawyer, Clair N. (Metcalf and Eddy, Boston, Massachusetts). 1962. CAUSES, EFFECTS, AND CONTROL OF AQUATIC GROWTHS. Jour. Water Pollution Control Fed. 34(3 Pt. 1): 279-288; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17711. 1962.

Chlorophyll-bearing aquatic plants are dependent for growth on the same nutrient or fertilizing elements as land plants. Major nutrients are nitrogen and phosphorus derived from ground-waters, surface runoff, and domestic and industrial wastewaters. Overfertilization results in the production of excessive growths which often become nuisances to man and even fatal to other forms of aquatic life, particularly fish. Temporary control is usually accomplished by physical or chemical means but ecological control is the only certain and lasting method. To date, ecological control has been limited to diversion of domestic sewage or sewage treatment plant effluents away from affected areas in a few instances. Other methods of ecological control will be required

in many situations where diversion will be impractical. (Auth.)

5409. Wurtz, Charles B., and Colton H. Bridges (Consulting Biologists, Incorporated, Philadelphia, Penna.). 1961. PRELIMINARY RESULTS FROM MACRO-INVERTEBRATE BIOASSAYS. Proc. Pennsylvania Acad. Sci. 35: 51-56; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17721. 1962.

This project attempts to provide information on the biological effects of pollutants in streams subject to tidal influence near coastal lowlands. The median tolerance limit in parts per million was determined for sodium chloride, zinc sulfate, copper sulfate, a synthetic detergent and temperature. A variety of invertebrate species were used, particularly the following: Limnodrilus hoffmeisteri, Erpobdella punctata, Helisoma campanulata, Gyraulus circumstriatus, Physa heterostropha, Sphaerium cf. tenue, Asellus communis, Argia sp., Tendipes decorus. The statis mortality level of many organisms was not reached within the normal 96 hours of the standard test. Tests were made in soft and hard waters. (Authors)

5410. Zimmermann, W. 1961. THE FEDER LAKE. (DER FEDERSEE.) xii+411p. Illus. Verlag Schwabischer Albverein: Stuttgart, Germany; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17724. 1962.

This volume concerns itself with Feder Lake, a great natural reserve rich in animal and plant life and world famous for its geological and prehistoric past. The author has created with the help of twelve experts of Feder Lake a detailed study of the wonders found there. The text is well-illustrated and documented and contains some 135 text pictures as well as 5 colored plates and maps and 18 tables. The work is also amply indexed. Chapter headings include: "A Study of the Factors Affecting the Plant Population of the Lake Marshes"; "Water Fauna of Feder Lake"; "Birds in the Vicinity of Feder Lake"; "Behavior of Lake Gulls"; "Contributions to the Climatology of Feder Lake"; "Concerning the Algae in the Vicinity of Feder Lake"; "Literature Concerning the Formation of Feder Lake"; "Feder Lake from the Glacial Period until the Present"; "Analytical Experiments Concerning Pollen with the History of Feder Lake from Prehistoric Colonization"; "Instability in the Delta by Prehistoric Feder Lakes"; "New Contributions to the Stratifications and Developmental History of Feder Lake Marshes". (J. G. S.)

5411. Dmitrieva, E. N. 1960. A COMPARATIVE ANALYSIS OF THE STAGES OF DEVELOPMENT OF PIKE-PERCHES (LUCIOPERCA LUCIOPERCA LINNÉ) FROM THE VOLGA, DON AND KUBAN RIVERS. (SRAVNITEL'NYI ANALIZ ETAPOV RAZVITIYA SUDAKA LUCIOPERCA LUCIOPERCA (LINNÉ) VOLGI, DONA I KUBANI.) Trudy Inst. Morfol. Zhivot, Akad. Nauk SSSR. 25. 99-136; Referat. Zhur., Biol., 1961, No. 1D454; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17734. 1962.

The transition of pike-perch from one stage of development to another in various reservoirs and even within the same reservoir takes place when the fish have attained various sizes; the stages are seen to follow one another in linear progression. During the postembryonic stages of development, the length of pike-perch from the Don and Kuban rivers is approximately the same. During the transition to active nutrition (at a length of 5.5-6.0 mm) in fish hatcheries, pike-perch should be fed rotifers and the early stages of Copepoda. When the fish are approximately 12 mm long they require a rich and varied plankton (Copepoda), while at a length of 14-15 mm they require large forms of plankton and possibly fish fry, and at a length of 21.0 mm they require young fish. When the young pike-perch reach a length of 30-50 mm they should be released from the fish hatcheries.

5412. Shemanskii, Yu. A. (Mesyatsev Acad. Sci. USSR, Leningrad). 1962. SOUND AND LIGHT HELP TO CATCH FISH. (ZVUK I SVET POMOGAYUT RYBOLOVSTVU.) Priroda 3. 112-115; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17752. 1962.

Baits which are artificially enhanced by associating them with the sound, sight, or smell of a desirable prey are very attractive for fish. "Noisy" bait, even a few pebbles in a soldered tin container, attract fish. Phosphorescent bait, either from naturally phosphorescent substances such as bacteria, or from chemicals including radium salts, attract fish at night or under other conditions of restricted visibility. And fish fat or even plant fat absorbed on a small object and tied to the line near the hook increases the catch. (C. C. S., Jr.)

5413. Grodzinski, Zygmunt. 1961. THE ANATOMY AND EMBRYOLOGY OF FISHES. (ANATOMIA I EMBRIOLOGIA RYB.) Panstwowe Wydawnictwo Rolnicze i Lesne: Warsaw, 319 pp.; Biological Abstracts, Vol. 39, No. 5, Abst. No. 17005. 1962.

This is a textbook for students of fishery colleges, not a biological monograph. The book contains in a small space a very large amount of information, surpassed perhaps only by the 3 volumes on fishes in the Grassé textbook. There is no histological chapter and very little place is taken by the microscopical anatomy. Only 2 chapters out of 12 are devoted to embryology, all the material on developmental anatomy being placed in different anatomical chapters. The book contains more than 500 line-and-dot drawings arranged in 257 figures. Eighty-three drawings are original or extracted from papers of author's collaborators, 50 are taken from other Polish sources. Every anatomical detail is considered from the functional and phylogenetic points of view. (H. S.)

5414. Abakumov, V. A. 1961. SEASONAL RACES OF MIGRATORY FISH. (SEZONNYE RASY PROKHODNYKH RYB.) Voprosy Ikhtiol. 17. 179-190; Referat. Zhur., Biol., 1962, No. 2I16; Biological Abstracts, Vol. 39, No. 5, Abst. No. 21220. 1962.

The existing hypothesis of P. Yu. Schmidt (1947)

states that the main role is played by the thermal factor in the formation of seasonal races of migratory fish; in disagreeing, the author states that the leading role is that of transgression and regression in the formation of seasonal races, since the two processes exert a considerable effect on the distribution and ecology of freshwater and migratory fish. On falling into the period of transgression of river systems, with the ending of the migrational path of the migratory fish and the ever-shortening intervals between the spawning grounds of the winter and spring fish, some specific features of their lives during the period of regression are retained to serve as a basis for forming seasonal races.

5415. Matsumoto, Walter M. 1962. IDENTIFICATION OF LARVAE OF FOUR SPECIES OF TUNA FROM THE INDO-PACIFIC REGION. Dana Rept. Carlesberg Found. 55. 1-16; Biological Abstracts, Vol. 39, No. 5, Abst. No. 21230. 1962.

Tentative identification of hitherto unrecognized larvae of Parathunnus sibi, Thunnus germo, T. orientalis and Kishinoella tonggol has been made among larval thunnids collected from Indo-Pacific waters by the Dana in 1928-30. Identification was made by segregating the larvae from 3 localized areas into various "types" on the basis of number and position of chromatophores on the body, particularly the chromatophores along the dorsal edge of the trunk. The number of larval types in each area was then compared with the species composition of adult thunnids caught on long-line fishing gear. Descriptions and figures are given. Neothunnus macropterus was also collected, but it has been previously identified and discussed by other authors. (Auth.)

5416. Vibert, R., P. Lamarque, and R. Cuinat (Station d'Hydrobiologie appliquée de Biarritz, France). 1960. TESTS ET INDICES D'EFFICACITÉ DES APPAREILS DE PÊCHE ÉLECTRIQUE. Annales de la Station Centrale d'Hydrobiologie Appliquée, Tome 8, pp. 53-89.

The authors recall the great importance of a high rate of efficiency in electric fishing. They point out the difficulties encountered in measuring directly in the rivers a rate of efficiency sufficiently objective to be used in comparisons.

They describe the tests used to compare, analytically, the advantages or disadvantages of the various electric devices or electric currents, in specific experimental conditions closely related to those existing in the field. They define series of indices, showing the relative importance of the differences in behavior of the fish in an electric field and which, taken together, can apparently be retained as an efficiency index.

5417. Willén, Torbjörn (Inst. of Systematic Botany, Univ. of Uppsala, Sweden). 1961. THE PHYTOPLANKTON OF ÖSBYSJÖN, DJURSHOLM. II. ECOLOGICAL ASPECTS. Oikos, Vol. 12, Fasc. 2, pp. 195-224.

A comparison between the phytoplankton composition at two stations in the lake did not show any great differences in horizontal and vertical distribution.

The phytoplankton development was followed daily during a week in July of 1958. Towards the end of the week some minor differences of the vertical distribution were noted due to a rising O_2 deficit near the bottom. Similar stratification was also observed in the summers of 1957 and 1959, followed by an occurrence of some specific mud organisms in the plankton.

A comparison between the plankton in the beginning of June during four years, 1957-1960, showed great differences both with regard to phytoplankton volume and to composition.

The highest volume figures were recorded before the ice had disappeared from the lake and not during the spring circulation. With regard to the oxygen conditions in the lake, autotrophic and heterotrophic phases were distinguished. During these phases specific algal communities were favored.

As to the phytoplankton some characteristic features have been emphasized: appearance of several mud organisms, scarcity of diatoms and dominance of chrysophytes. Comparisons have been performed with other investigated lakes of similar character. With regard to the phytoplankton volume and composition, Ösbysjön is to be characterized as a pond lake. (Auth.)

5418. Pejler, Birger (Zoological Institute, Uppsala, Sweden). 1961. THE ZOOPLANKTON OF ÖSBYSJÖN, DJURSHOLM. I. SEASONAL AND VERTICAL DISTRIBUTION OF THE SPECIES. Oikos, Vol. 12, Fasc. 2, pp. 225-248.

In late winter when the oxygen content is low, we find a strong decrease in species as well as in individuals. The oxygen tension (and/or related factors) often also affects the vertical distribution. Only very few of the zooplankters are restricted to cold water, probably because of the briefness of the period when the water is cold and the oxygen content high.

During the summer the following three rotifer species mainly dwell in a narrow zone close to the bottom: Anuraeopsis fissa, Polyarthra dolichoptera and Filinia terminalis.

The species composition of the rotifer plankton indicates a relatively high trophic level. Several heleoplanktic species (typical of ponds and other small waters) are found in Ösbysjön, whereas some of the commonest representatives of larger lakes are missing.

The closely related species Polyarthra vulgaris and P. major exclude each other in the lake, presumably because of excessive competition. The extinction of the former species during 1957 is connected with a sporozoan parasite epidemic.

Bosmina longirostris has occurred in the lake since the time it was isolated from the Baltic.

5419. Lewis, J. R. (Dept. of Zoology, Univ. of Leeds, England). 1961. THE LITTORAL ZONE

ON ROCKY SHORES - A BIOLOGICAL OR PHYSICAL ENTITY? Oikos, Vol. 12, Fasc. 2, pp. 280-301.

The complete physical environment of the shore (resulting from tidal or other fluctuations of sea level and influenced greatly by the effects of exposure, aspect, latitude, topography, and the existing population), cannot be measured and it is therefore inappropriate to define and delimit zones by reference to one factor - the tides - alone. Organisms must be used, and then it is found that the principal biological horizons of the shore do not coincide with the limits of the intertidal zone.

In the lower shore the upper limit of sublittoral organisms (laminarians in N. W. Europe) lies variously above E. L. W. S., while in the upper shore the upper limits of the barnacle/fucoid and the littorinid/Verrucaria belts both lie within tidal limits in shelter, but may rise to small and considerable heights respectively above E. H. W. S. on exposed shores.

It is proposed to recognize a biologically defined littoral zone which is distinct from the physically defined intertidal or littoral zone: it is bounded below by the upper limit of sublittoral organisms, and above by the upper limit of marine organisms.

It is proposed to recognize:

(1) a sublittoral zone in which there may be local biological justification for an upper sublittoral fringe.

(2) a littoral zone divided into

(a) eulittoral zone - the principal belt of littoral organisms, equivalent to the mid-, meso- and eulittoral of various previous schemes.

(b) littoral fringe - the marginal belt of littoral organisms, equivalent to the supralittoral zone or fringe of previous schemes.

(3) a maritime zone to refer to the lowest belt of terrestrial life above the littoral fringe.

Supralittoral is rejected as unsuitable for a zone defined or characterized by marine organisms.

Recognizing that the grounds on which the position of the upper limit of the littoral was decided might apply less forcefully outside N. W. Europe, and they would undoubtedly do so if it was felt that schemes of zonation should apply to sand and mud shores as well as to rock, a slightly modified terminology is proposed pending comment and opinion from other areas. (Auth.)

5420. Vanicek, David (Iowa Agric. and Home Econ. Exper. Sta., Ames, Iowa). 1962. LIFE HISTORY OF THE QUILLBACK AND HIGHFIN CARPSUCKERS IN THE DES MOINES RIVER. Proceedings of the Iowa Academy of Science, Vol. 68, pp. 238-246.

An age and growth study was made of 705 quillback. Carpiodes cyprinus, and 399 highfin carpsuckers, C. velifer, taken from the Des Moines River, Boone County, Iowa, from June 1 to August 24, 1960. The length-weight relationship, body-scale relationship and coefficient of condition of these two species are very similar, but the quillback is a larger and faster growing fish. Difficulty was encountered in distinguishing young quillbacks and highfins from the young of the other two species of carpsuckers found in the river. (Auth.)

5421. Neal, Richard A. (Iowa Agric. and Home Econ. Exper. Sta., Ames, Iowa). 1962. WHITE AND BLACK CRAPPIES IN CLEAR LAKE, SUMNER, 1960. Proceedings of the Iowa Academy of Science, Vol. 68, pp. 247-253.

Studies of white crappie, Pomoxis annularis, and black crappie, Pomoxis nigromaculatus, showed a shift in the population in Clear Lake during the past 10 years from a dominance of black to white crappies. A decrease in the rate of growth of black crappies was shown for this period although the rate of growth of white crappies has remained constant. The food habits of white and black crappies were very similar. The three most important food items were Cladocera, fish, and insect larvae, in that order. Young-of-the-year samples indicated that the trend toward white crappies was continuing. Turbidity was suggested as a possible reason for these changes. (Auth.)

5422. Cleary, R. E. (Iowa Cons. Comm., Biology Sta., Independence, Iowa), and J. K. Mayhew. 1962. AN ANALYSIS OF AN ALTERNATE-YEAR WALLEYE FRY STOCKING PROGRAM IN THE CEDAR RIVER IN IOWA. Proceedings of the Iowa Academy of Science, Vol. 68, pp. 254-259.

Year-class analysis of walleye, Stizostedion v. vitreum (Mitchill), taken by anglers in a portion of the Cedar River in Iowa indicated that alternate-year stocking of 3,500 fry per mile of river did not influence year-class abundance. Despite the short duration of the project, 1951-1958, a reasonably direct relationship between spring floods and spring air temperatures and year-class abundance was evident. Disparity in year-class abundance between samples taken 5 miles apart and within 3 months of each other, but by different methods (angling and chemical kill), indicates either a sampling selectivity or a relative discreteness or stability of portions of an assumed homogeneous population of river walleyes, or both. (Authors)

5423. Bezler, F. I., and N. A. Trifonova. 1960. DATA ON THE DISTRIBUTION OF OXYGEN IN THE RYBINSK RESERVOIR IN THE WINTER. (MATERIALY PO RASPREDELENIYU KISLORODA V RYBINSKOM VODOKHRANILISHCHE V ZIMNII PERIOD.) Byull. Inst. Biol. Vodokhranilishch 8/9. 72-78; Referat. Zhur., Biol., 1961, No. 20D606; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9274. 1962.

Investigations established that regardless of decrease in supply of water-soluble oxygen in winter, the oxygen balance of the reservoir was favorable for animal population, while during the period when water level was quite low, oxygen starvation phenomena occurred only in estuaries of rivers fed from bogs. Two reasons for decrease in O_2 content of reservoir water were disclosed: in nearby reaches of Mologa, Volga and Sheksninsk rivers chiefly because of the arrival of the oxygen in

combined form in the river water, while in the Perebor, in former streambeds of Mologa and Breitov, and probably in the mouths of smaller rivers, it was predominantly because of biological processes occurring in the reservoir.

5424. Heukelekian, H., et al. 1961. A REVIEW OF THE LITERATURE OF 1960 ON WASTEWATER AND WATER POLLUTION CONTROL. WATER POLLUTION. Jour. Water Pollution Control Fed. 33(7): 681-710; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9282. 1962.

Final section of annual literature review includes sections on pollution surveys and investigations, environmental requirements for aquatic life, toxic materials and wastes, effects of organic enrichment, radioactive wastes, microbiology, slime growths, chemistry, oxygen sag and stream self-purification, stream studies and surveys, stream standards, abatement and control, and effects on water supply. (I. G.)

5425. Vasil'eva, G. L., and O. M. Kozhova. 1960. SOME DATA ON THE BACTERIO-, PHYTO- AND ZOOPLANKTON OF THE IRKUTSK RESERVOIR IN THE YEAR OF ITS FORMATION (1957-1958). (NEKOTORYE DANNYE O BAKTERIO-, FITO I ZOOPLANKTONE IRKUTSKOGO VODOKHRANILISHCHA V GODE EGO OBRAZOVANIYA (1957-1958 GG.).) Byull. Inst. Biol. Vodokhranilishch 8/9. 5-8; Referat. Zhur., Biol., 1961, No. 20D612; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9290. 1962.

This investigation took place in 1958 when the plankton population had not yet definitively formed. The total number of bacteria reached 2 peaks: in April (up to 400,000 cells/ml) and in summer (up to 1,000,000 cells/ml). In summer the bacterial biomass amounted to about 0.7 mg/L. The phytoplankton developed differently in different areas. The area near the dam had the most algae. The maximum biomass was noted in August (0.15-0.34 g/m^3). In the upper and middle parts of the reservoir the phytoplankton did not develop as vigorously. The zooplankton maximum was observed in August, when the average biomass in the upper and middle parts of the reservoir was 130 mg/m^3, while in the lower part it was 492 mg/m^3 and varied considerably.

5426. Chvankina, M. A. 1961. FOOD INTERRELATIONS OF YOUNG FISH IN THE RYBINSK RESERVOIR. (PISHCHEVYE VZAIMOOTNOSHENIYA MOLODI RYB V RYBINSKOM VODOKHRANILISHCHE.) Voprosy Ikhtiol. 1(1): 107-118; Referat. Zhur., Biol., 1961, No. 21D358; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9310. 1962.

The young roach and perch compete with young bream for food. Competition for food between the young of the roach and bream was observed during 3 summer months. The greatest similarity in food among the young perch and bream was observed in July. With the wide spectrum of littoral feeding in the Rybinsk reservoir, the degree of coincidence of food for young roach and bream, and for young perch and bream, is less than with the narrow food spectrum in the pelagic feeding in the Volga near Uglich. The young roach compete for food with the young ide (Leuciscus idus). Between young pike and young bream there is no competition for food. The greatest competition for basic food between young of predatory fish and of cyprinids was observed for perch and roach. The food interrelations between young pike and roach are not great. There is no competition between young bream and roach and the young of the pike-perch (Stizostedion lucioperca), in view of the divergence in feeding grounds and non-correspondence of food spectra. The average degree of coincidence of diet composition among the young cyprinids is 47.4%, while that between cyprinids and the young of predatory fishes is 14.5%. The degree of coincidence of diet composition in young fish is higher than in adult fish. With maturity, the competition for food becomes lower as a result of divergence of food spectra.

5427. Ehrlich, S. 1961. EXPERIMENTS IN REVERSION OF THE FILLING UP PROCESSES IN FISH PONDS. Hydrobiologia 18(1/2): 136-154; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9320. 1962.

An account of the effect of introducing nutria, Myocastor coypu, into fish ponds as a means of keeping down the emergent vegetation which tends to slowly fill up the pond. The experiments were carried out in Poland and in Israel. In 1-3 seasons the accumulated organic sediments on the bottom of the ponds disappeared under the influence of a dense nutria population. The feeding habits of the nutria are very efficient at breaking down the vegetation as even parts of the plants which are not eaten are broken into small pieces and soon decay or are eaten by other organisms. Reed cutting, by hand or machine, is not as efficient as the activities of the nutria. The effect of the intensity of nutria action is discussed and it is found that only at high intensities is this effect found. At low stocking concentrations the filling up processes may be accelerated. Very high population densities maintained for a long time may result in the filling in process beginning again due to the activities of the nutria on the shore line carrying soil from on shore into the water. (K. E. M.)

5428. Gumerov, R. 1961. THE TRANSPORTATION OF FISH IN A HERMETICALLY SEALED CONTAINER WITH OXYGEN. (PEREVOZKA RYBY V GERMETICHESKOM CHANE S KISLORODOM.) Rybovodstvo i rybolovstvo 4. 16-17; Referat. Zhur., Biol., 1961, No. 24D565; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9329. 1962.

In 1960, for the purpose of stocking the lakes of the Transural region, fingerling carp were shipped in a rubber-coated canvas container with O_2. The distance from the water body to the fish hatchery was 1065-1155 km. At a temperature of 10° C, 1 kg of the hatchery stock required 113 mg

O_2/hour. The canvas container was placed in an iron vessel and was then filled with 100 l of water and a measured quantity of hatchery stock added. The stopper was slowly pressed in and the air withdrawn and replaced with O_2 by means of a rubber hose. The container was shipped by plane, and the temperature during the flight was 6-10°. Transportation of live fish in hermetically sealed containers with O_2 permits an increase in the transportation time or in the density of the stock without increase in the weight of the load. Milk bottles may prove suitable for shipping hatchery stock to collective and state farms.

5429. Shishkova, E. V. 1960. SOUND-REFLECTING CAPACITY OF PELAGIC AND BENTHIC FISH. (OTRAZHATEL'NAYA SPOSOBNOST' PELAGICHESKIKH I DONNYKH RYB.) Rybnoe Khoz. 10. 56-63; Referat. Zhur., Biol., 1961, No. 23D521; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9377. 1962.

To determine the initial size in planning hydroacoustic fish-hunting devices, a series of experiments was carried out in which the sound-reflecting capacity of live swimming fish was investigated. Measurements were made over a frequency range of 20-300 kilohertz. The experiments were conducted in the Black Sea with small and large hardtails Trachurus trachurus, spiny dogfish Acanthias acanthias, Black Sea flounders Pleuronectes flesus luscus, and sting rays Trygon pastinaca. The fish were 16-96 cm long and weighed 50-3760 g. The coefficient of reflection from a fish was determined by comparing the amplitude of echo signals from the live fish and its accurate foam-layer model with the calculated coefficient of reflection from the foam layer and the depth of submersion of reflecting objects. Different coefficients of reflection were established at frequencies of 50-300 kilohertz for fish with swim bladders (12-22%) and without swim bladders (7-19%). Both groups of fish give more reflection at high frequencies. In equal school numbers, large fish create more reflectivity; at an equal total weight of fish in a school, small fish give more reflection. A basis is offered for an empirical formula for the radius of a sphere equivalent to a fish school.

5430. Yasuda, F. (Univ. of Tokyo, Japan). 1960. THE TYPES OF FOOD HABITS OF FISHES (DETERMINED) BY STOMACH CONTENTS EXAMINATION. Bull. Japanese Soc. Sci. Fish. 26(7): 653-662; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9405. 1962.

Fishes were classified into 4 groups, plankton feeders, omnivorous, carnivorous and piscivorous, and the piscivorous group was also divided into surface and middle layer fish eaters and 2 bottom fish feeders. The amounts of food eaten by these fishes were classified into A, B, and C types, such as plankton feeders, omnivorous and some carnivorous fishes, and carnivorous fishes, especially piscivorous fishes, and each feeding group belongs to different types. The rate of occurrence of empty stomachs is high in adult fishes and also high in the high food order fishes. (G. G.)

5431. Zotin, A. I. 1961. THE RELATIVE FECUNDITY OF FISH AND THE SIZES OF THEIR EGGS. (OTNOSITEL'NAYA PLODOVITOST' RYB I RAZMERY YAITS.) Vopr. Ikhtiol. 1(2): 307-313; Referat. Zhur., Biol., 1961, No. 24D539; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9409. 1962.

The concept of relative fecundity (RF) is unsatisfactory since it lacks a basic value. Thus, RF is not a constant independent of weight and age in any species of fish. For this reason RF should be determined not as the relationship of the absolute fecundity to the weight of the fish, but as the coefficient of proportionality expressing a linear relationship between the absolute fecundity and the weight of the fish. The necessity for such a concept of the RF arises from the fact that a comparison between species, of any characteristic of fish involving fecundity, is only possible if the value of the characteristic fecundity is constant for a given species. Since a numerical relationship exists between the sizes of the eggs and RF, it is possible to formulate the following equation:

$$\lg r_O = -a (\lg V_H) + \lg b$$

where r_O = RF; V_H = the volume of the fertilized egg; and a and b are constants. Hence $r_O = b V_H^{-a}$.

5432. Brown, A. W. A. (Univ. of Western Ontario, London, Canada). 1961. THE EFFECT OF THE CHEMICAL CONTROL OF INSECTS ON WILDLIFE CONSERVATION: EVALUATION OF THE PRESENT IN THE LIGHT OF PAST EXPERIENCE. Proc. Entomol. Soc. Ontario 91: 40-46; Biological Abstracts, Vol. 39, No. 3, Abst. No. 9419. 1962.

A symposium paper reviewing the effects of DDT, BHC, the cyclodiene compounds and the organophosphorus insecticides on birds, mammals and fish. The importance of dosage levels is stressed; for example with DDT the following levels of application are safe within reason: 5 lb./acre for mammals, 1 lb./acre for birds and 0.2 lb./acre for fish. Dutch elm disease control with DDT may exceed this safe level for birds, and so may fire ant control with the cyclodiene compounds. The review is provided with a concise bibliography of up-to-date sources. (Auth.)

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C. C. Davis
Isaac Gillman
G. Gunter
K. E. Marshall
J. G. Scully
S. F. Snieszko
C. C. Sturgis, Jr.
H. Szarski
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Created in 1849, the Department of the Interior--America's Department of Natural Resources--is concerned with the management, conservation, and development of the Nation's water, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

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